

*A River Runs Through It:  
Re-Imagining Kuta's Neglected River*

Tai Sunnland  
December 2013

*Submitted towards the fulfillment of the requirements for the Doctor of Architecture degree.*

**School of Architecture  
University of Hawai'i at Mānoa**

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*We certify that we have read this Doctorate Project and that, in our opinion, it is satisfactory in scope and quality in partial fulfillment for the degree of Doctor of Architecture in the School of Architecture, University of Hawai'i at Mānoa.*

Doctorate Project Committee

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## **ACKNOWLEDGEMENTS**

I would like to express my sincere gratitude to my project chairperson, Kazi Ashraf, for his guidance, mentoring, and support. I would also like to thank my committee members, Geoffrey Lewis and Ashok Das, for their motivation, critiques, and genuine interest in my project. Lastly, I would like to thank my family and friends, especially my parents for their unconditional love and support, without whom none of this would be possible.

Mahalo Nui Loa

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## **GLOSSARY**

\*All words are Indonesian (*Bahasa Indonesia*) unless otherwise noted.

<i>Adat:</i>	tradition
<i>Alang-alang:</i>	grass-thatch hipped roof (Balinese)
<i>Aling-aling:</i>	free standing wall (Balinese)
<i>Alun-alun:</i>	empty field (Balinese)
<i>Awig-awig:</i>	customary law (Balinese)
<i>Bacingah:</i>	village square (Balinese)
<i>Bale:</i>	pavilion
<i>Bale kul-kul:</i>	signal tower (Balinese)
<i>Bali Aga:</i>	Mountain Balinese (Balinese)
<i>Banjar:</i>	hamlet groups (Balinese)
<i>Banten:</i>	sacrificial offerings (Balinese)
<i>Basa Bali:</i>	Balinese language (Balinese)
<i>Beringin:</i>	large banyan tree (Balinese)
<i>Bhurloka:</i>	underworld (Balinese)
<i>Buwahloka:</i>	fertile world of man (Balinese)
<i>Candi bentar:</i>	symmetrical split gate
<i>Dadia:</i>	ancestral kinships (Balinese)
<i>Desa:</i>	traditional village
<i>Gamelan:</i>	traditional percussion orchestra
<i>Gang:</i>	alleyway (Balinese)
<i>Griya:</i>	Brahmana priest (Balinese)
<i>Jaba:</i>	house forecourt (Balinese)
<i>Jalan:</i>	road
<i>Kaja:</i>	sacred mountains (Balinese)
<i>Kangin:</i>	towards the sunrise or east (Balinese)
<i>Karang:</i>	village households (Balinese)
<i>Karya:</i>	ritual (Balinese)
<i>Kauh:</i>	towards the sunset or west (Balinese)
<i>Kelod:</i>	profane sea (Balinese)
<i>Lawang:</i>	compound (Balinese)
<i>Lete:</i>	pollution (Balinese)
<i>Lontar:</i>	palm leaves
<i>Lumbung:</i>	rice granary (Balinese)
<i>Madya:</i>	neutral (Balinese)
<i>Musim hujan:</i>	wet season
<i>Musim panas:</i>	dry-season
<i>Natah:</i>	central courtyard (Balinese)
<i>Niskala:</i>	intangible (Balinese)
<i>Nista:</i>	profane (Balinese)
<i>Obyeks:</i>	objects
<i>Odalan:</i>	temple anniversary (Balinese)
<i>Orde Baru:</i>	new order

<i>Paduraksa:</i>	roofed gate form (Balinese)
<i>Pampatan agung:</i>	auspicious intersection (Balinese)
<i>Paon:</i>	kitchen (Balinese)
<i>Paraken:</i>	servants
<i>Parhyangan:</i>	man's harmonious relationship with the gods
<i>Pariwisata budaya:</i>	cultural tourism
<i>Pasar:</i>	village market
<i>Pawongan:</i>	man's harmonious relationship with other humans
<i>Pelemahan:</i>	man's harmonious relationship with nature
<i>Pemaksan:</i>	temple congregations (Balinese)
<i>Pemangku:</i>	lay priest (Balinese)
<i>Pendanda:</i>	high priest (Balinese)
<i>Puputan:</i>	court suicides (Balinese)
<i>Pura:</i>	temple complex
<i>Pura bale agung:</i>	main village temple
<i>Pura dalem:</i>	temple of death
<i>Pura puseh:</i>	temple of origin
<i>Puri:</i>	palace
<i>Sate:</i>	barbeque skewers
<i>Sawah:</i>	wet rice fields (Balinese)
<i>Seka:</i>	volunteer groups (Balinese)
<i>Sekala:</i>	tangible (Balinese)
<i>Subak:</i>	agricultural societies (Balinese)
<i>Swahloka:</i>	heaven
<i>Tanah:</i>	land
<i>Tebe:</i>	gardens
<i>Tegal:</i>	dry-lands
<i>Tri hita karana:</i>	Balinese-Hindu philosophy
<i>Tri karhyangan:</i>	main village temples
<i>Undagi:</i>	architect (Balinese)
<i>Utama:</i>	sacred (Balinese)
<i>Wantilan:</i>	meeting pavilion (Balinese)

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## I. ABSTRACT

Water plays a fundamental role in Balinese culture. The Balinese religion known as *Agama Tirta*, “the religion of holy-water,” enforces the philosophy of *tri hita karana*, which instills an interrelationship of spirit, human, and nature. The physical manifestation of this philosophy is Bali’s cultural landscape, a landscape shaped by an ancient social organization and system of water irrigation, known as the *subak*, for the cultivation of wet rice (*sawah*) over the past millennium. Fundamental to the agricultural infrastructure is the network of water temples which intangibly connects each *subak* sharing the same water sources. The temples sanctify water from its mountain source, through numerous rice terraces, and eventually emptied into the ocean. Due to the cultural significance of Bali’s water culture, Bali’s networks of water temples, *subak* organizations and engineered landscape have recently been deemed an UNESCO World Heritage site. The *subak*, and its mastering of water hydrology, has allowed Balinese civilization to reach the heights it has today. However, as modernization and globalization, spurred by tourism, continues to pave over Bali’s natural and cultural landscape, the *subak* and Bali’s inland water sources have greatly suffered in urbanizing areas. As a result, Bali’s waters have become heavily polluted and neglected, a stark contradiction to the philosophy of *tri hita karana*.

Kuta, a coastal district in southern Bali, is Indonesia’s most popular tourist destination welcoming nearly six million foreign and domestic visitors annually. Once a quiet fishing and farming village hidden within a dense coconut grove, Kuta's seemingly endless white sand beach, tropical environment, and holiday atmosphere attract travelers from around the world. In response to growing visitor numbers and the desire to modernize, a large boom of unrestricted and unplanned development has transformed the once lush coastline into a bustling commercial zone forever altering the traditional village-scape and landscape due to minimal effort in preserving and reinforcing traditional Balinese socio-spatial qualities, *subak* infrastructure, and important natural ecological systems, especially the Tukad Mati River and Prapat Benoa mangrove forest, both of which are for the most part out of view and inaccessible for the general public. Furthermore, a lack of public space prevents any synergistic interaction between tourists and the local

population, augmenting the social and economic disparities between the parties.

In reaction to the issues currently facing Kuta, I explore the intricacies of Bali's complex culture, which have shaped its built and natural environments, the impact and influences of tourism in Bali, and contemporary theories of place-making, urban identity, and landscape urbanism. The research guides an urban design proposal for Kuta, reclaiming its neglected Tukad Mati River as an axis of urban development; conceptually reinventing the network of water temples and *subak* as a series of spaces and urban nodes that integrate civic, landscape, and hydrological infrastructural functions in order to bring awareness to an ancient cultural landscape.

## II. INTRODUCTION

Born and raised in Hawai‘i, I have gained an understanding of how important the tourism industry is for the economy of our island-state. Tourists travel to our island to relax, explore, and learn about different people, cultures and the environments that have shaped them, but like most they always return home. Yet, these short trips, multiplied by the other hundreds of thousands of travelers, heavily impact the economical and social welfare of our society. Following in the footsteps of Hawai‘i, the island of Bali, in the nation-archipelago of Indonesia, has become a name synonymous with images of paradise, luxury living, an exotic culture, and beautiful architecture; and like Hawai‘i faces an unsure, yet optimistic, future as an international tourist destination.

I was formally introduced to Bali nearly fifteen years ago during a family vacation to the resort island. The pompous temple ceremonies, daily religious rituals, lush landscape, perfect surf, and most importantly, its people had captured my heart and imagination. It was like the books told, a true paradise. I have visited Bali nearly each year after my initial trip, and with the completion of a family home in a small fishing village on the island's east coast, Bali is now a second home. Today, as a student of architecture and having witnessed over a decade of Bali's rampant growth as a global destination, my interest in Bali has shifted more from leisure to academic and architectural practice.

The spotlight on Bali as an international destination has spurred heavy resort-related and infrastructural developments island-wide. The village cum tourist town of Kuta has had the biggest share of investment due to its central location on the island and proximity to the Ngurah Rai International airport, and primarily its gorgeous sunset-facing, seemingly endless white sand beach. The spontaneous development has heavily degraded Kuta's natural environment, disrupting natural storm water drainage, destroying the ancient and traditional agriculture irrigation system known as the *subak*, exhausting and polluting groundwater supplies, due in most to the converting of prime agriculture land into hotels, restaurants, and supporting infrastructure, much of which is operating above capacity.

Current urban planning has not been able to the answer all of Kuta's development



problem and typically sets a foundation based on the interests of private enterprises and capitalist ventures, heavily contrasting traditional settlement patterns and land use. Little has been done in the planning and design of Kuta's civic spaces, excluding existing traditional temple and the village's public spaces that encourage cross cultural interaction between visitors and locals. The infrastructural necessities to deal with vehicular and pedestrian circulation, and the efficient control and preservation of natural ecological processes and systems are also meager at best. These developmental issues have conjured a growing negative image from new and returning visitors to the island. With threats of not returning to the "paradise" island due to the unhealthy condition of the urban and natural environment, Bali's government and stakeholders risk to lose a lot if measures are not taken to remediate Bali's growing pains.

As with most coastal destinations, Kuta's real estate value is based on proximity from the beach front. However this contrasts the indigenous cultural perception and belief of the ocean as an absorber of ritual and material wastes; rivers and streams as cleansers and transporters of physical and metaphysical impurities. Bali's inland and coastal waterways and ecosystems, which include the Tukad Mati River and Prapat Benoa mangrove forest, have been greatly neglected in the major scheme of Kuta's growth. This interesting paradox of cultural views opposing tourist attractions spurred the idea of reversing Bali's cultural and public intuitions of the river and ocean as a dump for material waste by the design and construction of civic and landscape infrastructural interventions along the river. By re-imagining and transforming Bali's ancient system of water temples and *subak* into contemporary urban infrastructure, the river itself becomes a civic space for public enjoyment and recreation, connecting tourists and locals, and juxtaposing nature and city, rooting future development along the river into Bali's water culture. In addition to civic purposes, landscape and architectural design strategies and technologies can be applied to remediate, restore, and improve the river's and mangrove forest's water quality and biodiversity.

Design research for this project is based on the four objectives. In the first objective, logical argumentation is used to comprehend the socio-spatial arrangements and

hierarchies associated with traditional Balinese villages and dwellings. In the second objective, interpretative historical research is used, supported by a number of maps and numerical data. The research for the second objective is intended to understand physical conditions and patterns of land use and development in Kuta. In the third objective, qualitative research is employed to gain an understanding of how the Balinese culture and society have been influenced and impacted by tourism, and associated modernization and globalization. And finally, in the fourth objective, qualitative research is again used to understand contemporary theories of place-making and landscape urbanism.

In conjunction with the design research, using maps provided by the *Bappeda Badung* and satellite maps through Google Maps, section studies, a conceptual "MRI" of the Tukad Mati River expose existing conditions of the river itself and surrounding land use, infrastructure, and building inventory. The "MRI" is intended to serve as a basis from which the proposed urban interventions can potentially transform the Tukad Mati River and Ngurah Rai mangrove forest from polluted ecosystems to become another of Kuta's celebrated and enjoyable attractions.<sup>1</sup>

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<sup>1</sup> Secondary data for this project were in the form of maps, reports, numerical data, and other written material. Information included maps of land use of southern Bali, maps of zoning, land use and building types in Kuta, the 2010 census (population and tourism statistics), the 2009 Zoning and Spatial Planning Bylaw, and the Kuta Tourism Master Plan.

### III. Bali: An Island Mandala

Bali is a tropical island in the center of the vast Indonesian archipelago located about 8 degrees south of the Equator between the islands of Java and Lombok. Roughly 5,600 square kilometers, it is quite an anomaly that Bali attracts more attention than the republic it belongs to, considering that Bali covers less than 0.3% of the land surface of Indonesia (Hitchcock and Putra, 2007, 1). An active volcanic ridge stretches from *Gunung Batukaru* in the west to *Gunung Agung*, Bali's largest and most holy mountain in the east, which separates the narrow arid coast in the north from the lush fertile "heartland" in the south. Originating at these volcanoes, springs and crater lakes feed rivers which have carved out deep valleys forming narrow ridges, making east-west travel difficult within the mountainous regions of the south. For over a millennium, the Balinese have constructed and perfected a complex irrigation system known as the *subak*, tapping the island's numerous rivers to irrigate their wet-rice terraces; which have been the root of the island's economy and the foundation of the civilization and culture.



Figure 1. The Island of Bali, Indonesia.  
Source: Google Earth

Densely populated, especially in the south-central agricultural plains, Bali's population is approximately 3.8 million and growing. Around 90% of the population is Balinese-

Hindu<sup>2</sup> with a small but increasing minority of Muslims and Christians. A small, yet very important, population of *Bali Aga* still dots the highlands and some coastal regions, such as Trunyan village on the shores of the crater-lake in *Gunung Batur* and the most famous of all *Bali Aga* villages, Tenganan, a few kilometers inland from the small coastal tourist town of Candi Dasa on Bali's east coast. The *Bali Aga*, translated to the "Mountain Balinese," are believed to be descendents of the original Balinese inhabitants prior to the arrival of the Majapahit Hindu-Javanese immigration. Living in isolated areas throughout the island, the Bali Aga culture differs from that of the Hindu-influenced Balinese, however ancestor worship and animism are shared traditions.

The Balinese language (*Basa Bali*) is part of the Austronesian linguistic family, which includes languages of maritime Southeast Asia, Oceania, believed to have originated from South China and Taiwan. *Basa Bali* consists of three hierarchal languages dependent on the speakers' societal caste, which is not as strict as the Indian caste system. Although *Basa Bali* is the indigenous language, its daily use in schools, government and public institutions, and mass media is decreasing, where the use of *Bahasa Indonesia*, Indonesia's national language, is common. However, most Balinese speak in their native tongue when speaking to other Balinese, especially with friends and family members.

The Balinese live in traditional villages (*desa*) formed by ancestral kinships (*dadia*) and belong to various social organizations. Until the arrival of tourism, nearly all Balinese were wet-rice farmers averaging two to three harvests a year. Today, economic opportunities have diversified, with a majority of the work found in the tourism sector and associated industries – construction, transportation, health, and commerce. Farming is still a way of life for many, predominantly the rural poor, yet is far less lucrative and holds less prestige (Howe 2005, 9).

### **Cosmological Order**

The Balinese believe they inhabit a universe that is influenced by tangible (*sekala*) and

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<sup>2</sup> Balinese-Hinduism in Indonesia is referred to as *Bali Hindu-Dharma*. However, Balinese refer to their religion as *Agama Tirta*, the religion of holy water.

intangible (*niskala*) beings and forces. These forces may be generative or degenerative, or both, and are considered to complement (*rwa bhineda*) rather than oppose each other (Samadhi 2001, 562). Man is positioned in the center of the forces, coexisting and seeking to maintain balance with a system of rituals (*karya*) based on the use of sacrificial offerings (*banten*). Macrae (Rubinstein and Connor 1999, 125) explains, “this system is structured within an elaborate ordering of time and space into interconnecting rhythms and contours of spiritual appropriateness.” The philosophy known as *tri hita karana*, meaning "three causes to welfare and security," reinforces the balance of opposites by maintaining man’s harmonious relationship with the gods (*parhyangan*), with other humans (*pawongan*), and with nature (*pelemahan*). Fundamental to the Balinese religion and culture, *tri hita karana* influences all aspects of life, from daily rituals and rites of passage to the construction process. Spatial order and hierarchies are defined by the tripartite classification known as *tri angga*, which orients and describes all things in Bali as sacred (*utama*), neutral (*madya*), or profane (*nista*).

To the Balinese, the deities are the most pure beings, occupying the space above the human realm with their abode in the mountains. The sea is considered to be the absorber of pollution (Howe 2005, 9) as material deemed impure, such as used ritual offerings, are discarded into the rivers to be dissolved by the sea. The Balinese occupy the fertile world of man (*buwahloka*) lying between heaven (*swahloka*) and the underworld (*bhurloka*). Thus the most important geographical axis is one that goes from the sacred mountains (*kaja*) to the profane sea (*kelod*). Augmenting this principle axis is another set of hierarchal directions: towards the sunrise or east (*kangin*) and towards the sunset or west (*kauh*). The two axes intersect at the neutral center known as the *puseh* or *tengah* where power, whether religious, cosmological or political, is derived. Further division of the four-around-the-center idea by Hindu symbolism developed into a eight-around-the-center mandala known as *nawasanga* (Tan 1967, 444), which is extensively applied to the arrangement of space for villages, temples, and houses. *Gunung Agung*, the highest mountain on Bali and geographically located in the northeast of the island, is considered the most sacred mountain on the island. Therefore, the direction of *kaja-kangin* is oriented towards the holy mountain. Due to the centrality of Bali's mountains, Leo Howe

suggests that the *nawasanga* "provides a topographical rather than a cardinal grid" (Howe 2005, 10) as *kaja* is to the north for inhabitants of South Bali and to the south for those in North Bali.

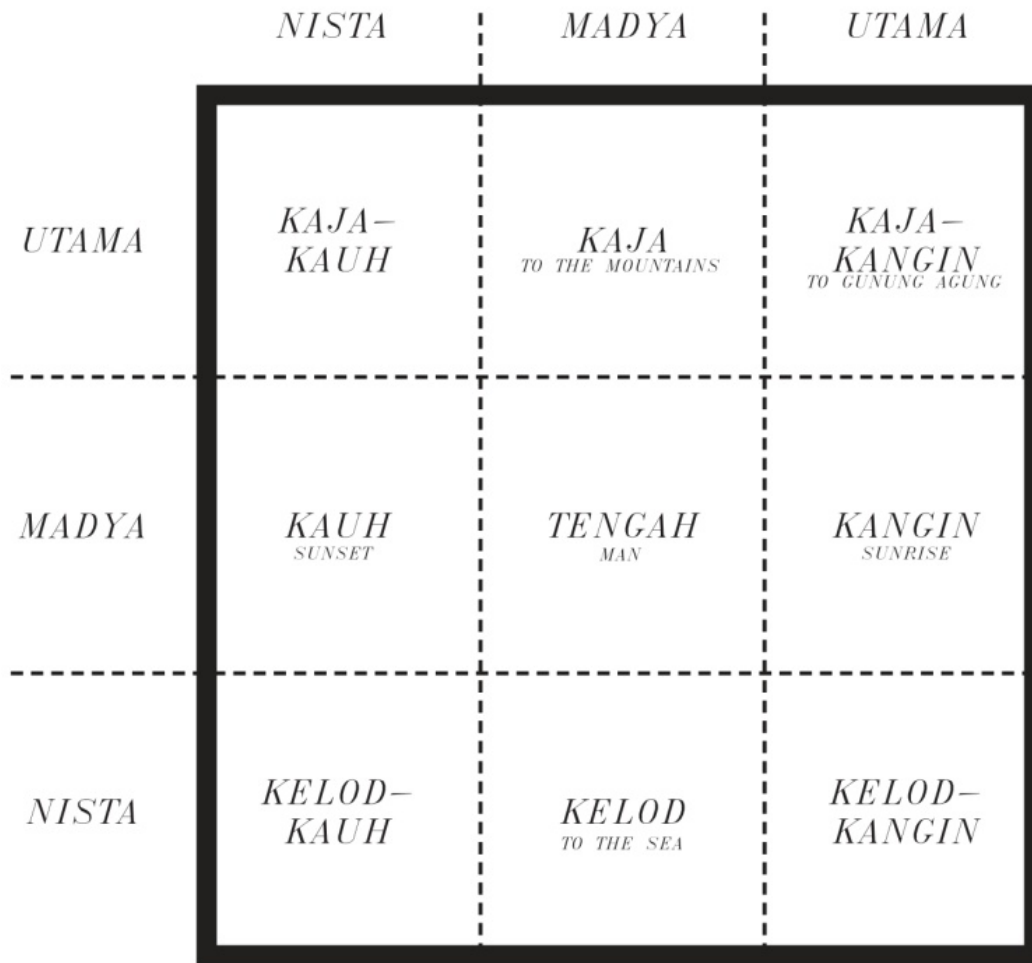


Figure 2. Schematic combined diagram of a *tri angga* and *nawasanga* orientation hierarchy.

*utama* - sacred  
*madya* - neutral  
*nista* - profane

### ***Desa*: The Balinese Village**

Miguel Covarrubias described the Balinese village as a "unified organism in which every individual is a corpuscle and every institution an organ" (Covarrubias 1937, 36). Each *desa* "embodies an ordering of religious values, customary law (*awig-awig*) and local knowledge in the public interest" (Pratiwi 2010, 267). Although most Balinese villages

seem similar in appearance, Geertz (1959, 991) suggests “there is no simple uniformity of social structure . . . no 'average' village.” Instead, “there is a set of marvelously complex social systems, no one of which is quite like any other” Villages vary in size and structure depending on location, population, and social structures. Members of a particular village are called *krama desa*.

Balinese villages, traditionally called *desa*, exhibit a ribbon pattern of development, with a central nucleus from which family compounds branch. Today, due to changes in policy during the Dutch colonial period, the *desa* is known as *desa adat*, literally translating to “traditional village.” During the colonial period, the Dutch used territorial lines as a means to manipulate village administration. This was done in order to easily control the Balinese. The administrative territories are called *desa dinas* (Copeland and Murni 2010, 4). *Desa dinas* may overlap several *desa adat*. Therefore there are two village organizations at the macro level: the *desa adat*, which deal with ritual and religious activities, and the *desa dinas*, which is responsible for civic and security issues.

Following the cosmological principles, the main village thoroughfares are aligned on the *kaja/kelod* and *kangin/kauh* axis forming an auspicious crossroad, the *pampatan agung*. It is at this intersection where the village square, *bacingah*, exists, where village life is most active and where the village draws its “power” from. The *bacingah* exudes a layer of geomancy similar to dwelling plans. The residence of the ruling family or family of closest descendant to the village founders, considered a palace (*puri*), occupies the *kaja-kangin* corner of the square. The village market (*pasar*), a meeting pavilion (*wantilan*), signal tower (*bale kul-kul*), and often an empty field (*alun-alun*) are located along the *kelod* and *kauh* edges.<sup>3</sup> In many instances a large banyan tree (*beringin*), auspicious to the Balinese, preferably occupies space in the *kaja* direction adjacent to the dwelling of a Brahmana priest (*griya*) (Howe 2005, 11). Today, the picturesque ideal of the village square and original crossroad is often hard to discern in urban locales due to modern development. Most *desa* also are located close to a water source, such as a river or stream, where villagers traditionally went to collect drinking and cooking water as well as

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<sup>3</sup> Arrangements vary from village to village.

to bathe and defecate. Below (fig. 3), an ideal village layout is presented to reinforce the cosmological order that governs the decisions of traditional planning and arrangement.

Essential to all villages is the tri-fold temple set, the *kahyangan tiga*, meaning the "three places of the gods" (Geertz 1959, 992): the *pura puseh*, *pura bale agung*, and *pura dalem*. Old temples can have congregations (*pemaksan*) of several thousand families often from "descendant" villages that had branched off at one point in the past. Village social organizations are stratified and often extend into other, usually neighboring villages. The *pura puseh*, located within the *kaja-kangin* extents of the village, is dedicated to the ancestral village founders and believed to be built at the time of first settlement. The *pura bale agung*, also referred to as *pura desa*, is the main village temple, the "great council temple"; primarily dedicated to maintaining the fertility of the rice fields (*sawah*) and located within the *kaja* portions of the village square. Completing the set, the *pura dalem*; a temple dedicated to the spirits of the dead is located at the *kelod* boundary of the village. There are numerous villages that do not have a full set; instead the *pura bale agung* functions as the *pura puseh*.

The *desa adat* was traditionally in control of administering village land privileges. Land (*tanah*), which is considered the property of the gods, is managed under various categories ensuring a balanced use. Pratiwi (2010) has translated the Indonesian descriptions by Griadhi and Suasthawa (1985) regarding the various Balinese land categories: *Tanah pekarangan desa* are lands consisting of village households (*karang*) and gardens (*tebe*). The *karang* may only be passed from generation to generation and may not be sold. *Tanah ayah desa* are the surrounding agricultural lands, which includes the rice fields (*sawah*) and dry-lands (*tegal*). Agricultural plots may be privately owned or leased, and are taxable. *Tanah laba pura* are productive lands tied to village temples and managed by a high priest (*pedanda*) or lay priest (*pemangku*). *Tanah druwe desa* are the village's common lands which includes the village square, market, meeting hall, and cemeteries. An intangible and practical link between gods, humans, and the natural environment, village land, especially *tanah ayah desa*, is the primary source for built and natural environment changes in Bali (Pratiwi 2010, 268). Although traditional



management systems are still used today, Indonesia's national land law, The Basic Agrarian Law of 1960 (*Undang-Undang Pokok Agraria*), supersedes traditional *adat* law, privatizing traditional village land and potentially destroying the fundamental relationship between the Balinese, their environment, and the gods (*tri hita karana*).

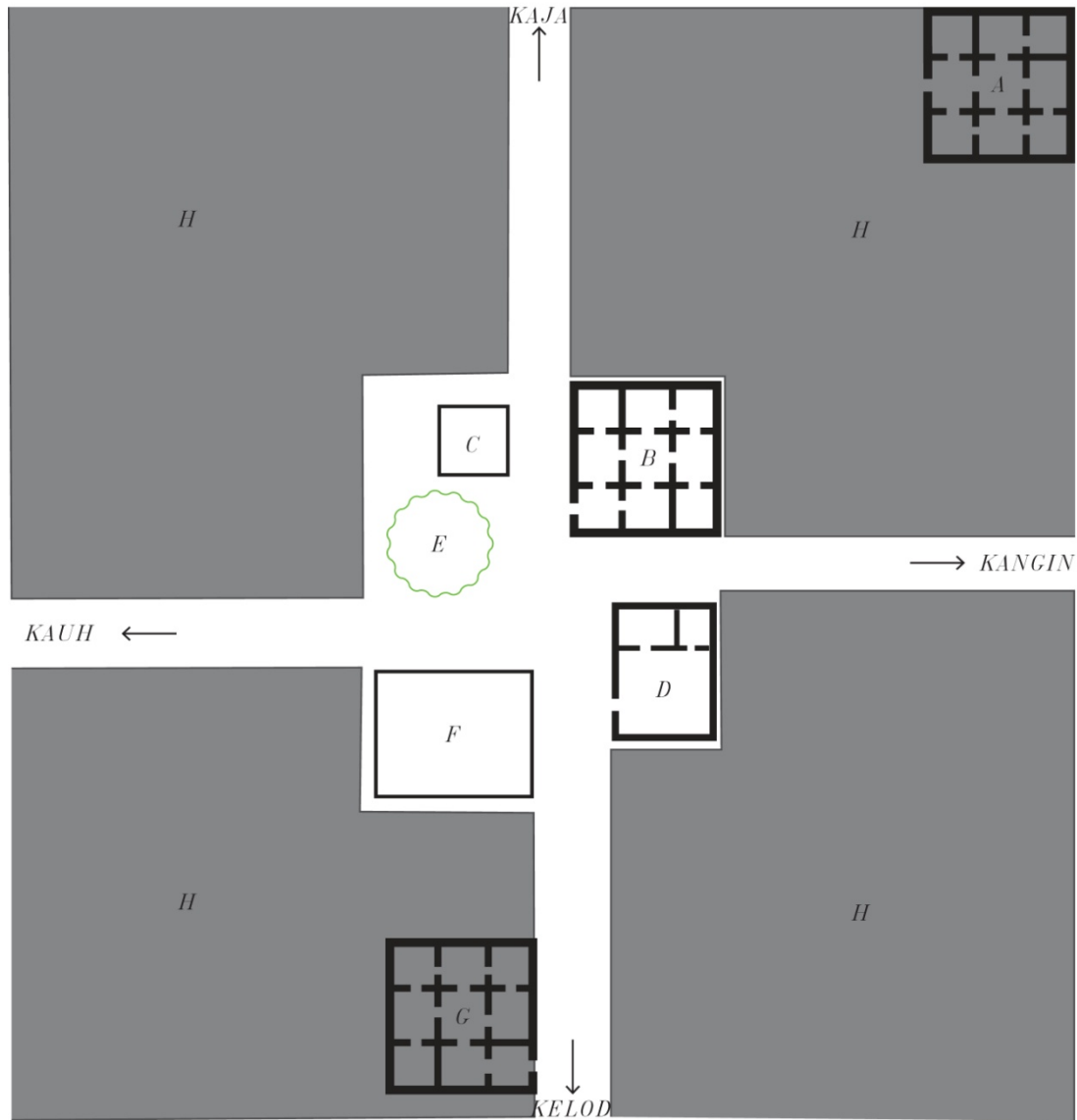


Figure 3. Schematic diagram of a traditional village square (*Bacingah*)  
Not To Scale

- |                      |                               |
|----------------------|-------------------------------|
| A. <i>Pura Puseh</i> | E. <i>Beringin</i>            |
| B. <i>Pura Desa</i>  | F. <i>Pasar</i>               |
| C. <i>Wantilan</i>   | G. <i>Pura Dalem</i>          |
| D. <i>Puri</i>       | H. <i>Pekarangan and Teba</i> |

### **Water, the *Subak*, and Bali's Cultural Landscape**

Balinese culture would not have reached the heights of complexity and achievement it has today without the system of water irrigation and rice cultivation known as the *subak* which has developed over the past millennium. The verdant sculpted wet rice terraces (*sawah*) are perhaps the island's most famous man-made wonder and have been recently recognized by UNESCO as a *World Cultural Heritage Site* in 2012 (fig.8). As Bali's cultural landscape, Lansing (1991, 12) explains "over the course of many generations the primeval landscape of forested hillsides has been transformed into a productive system of terraces, tunnels, and irrigations systems, which 'shape social relationships.'" The Balinese religion known as *Agama Tirta*, or "holy-water religion" stresses that water (*tirta*, Balinese) is a gift from the gods to be carefully used by the inhabitants of Bali reinforcing the concept of *tri hita karana*. Highlighting this concept, all *subak* associations are interconnected by a network of water temples where rituals, offerings, and performances are made to sustain a harmonious relationship between the Balinese, the natural environment, and the spiritual world. The system of water temples also "defines connections between productive groups and the components of the natural landscape that they seek to control" (Lansing 1991, 52). *Subak* temples link hierarchically to a source of water with the most sacred of water temples, *Pura Ulun Danu Batur*, located in the crater lake of *Gunung Batur*, where the Balinese spiritually believe all of Bali's water sources begin. Lansing (1991, 52) suggests "the temples provide a vehicle to achieve voluntary social cooperation in the management of the irrigation on which each village—and society as a whole—is utterly dependent."

*Subak* components are the forests that protect the water shed, terraced rice fields (*sawah*) connected by a system of canals, tunnels and weirs, villages, and temples of varying size and importance that mark either the source of water or its passage through the temple on its way downhill to irrigate *subak* land. The terraces are irrigated efficiently with no blockage of flow. The water then re-enters the river system before being flushed out to sea. Dependent on the upstream waters, downstream farmers are susceptible to irrigation manipulations by upstream farmers. In addition to religious ritual practices, secular obligations are embedded within the *subak*'s responsibilities.

Bali's approximately 1,200 *subak* collectives, each ranging from 20-400 members, and associated water temples cooperatively ensure water is distributed fairly among all *sawah* during the dry season (whc.unesco.org). If water is diverted or cut off without consultation, downstream farmers may suffer and lose their crop. However, adverse diversions rarely occur due to the cooperation between *subak* associations sharing the same water source. Lansing (1991, 12) suggests "the terraces are a social creation, an artificially constructed ecosystem, sustained by continuous human management." *Subak* membership is determined by the use of land watered by a common source (Copeland and Murni 2010, 274). It is mandatory for farmers who own or lease land to join the *subak* and, like the *banjar*, it is a democratic organization in which members share equal rights free from caste divisions and royal interference (Lansing 1991, 27). Because a source of water may stretch over several kilometers farmers within a *subak* may be from various villages. Meetings are held monthly at the water temples to decide issues regarding rice cultivation. Lansing (1991, 27) lists the secular work obligations of the *subak* which include: "(1) maintenance of the dam and conduits and the various installations; (2) inspection and patrolling of the conduits; (3) maintenance of roads and culverts; (4) policing the *subak* and assisting the *klian* (*subak* head); (5) construction and maintenance of buildings." The *subak* also coordinates and determines times for planting, harvesting, rotations, methods of pest control, and fertilizing, as well as impose fines and punishments (Copeland and Murni 2010, 275-276).

The water distribution infrastructure were traditionally made of compacted earth and supported by retaining walls of field stone, however concrete has become a common material due to its durability and longevity (fig. 9 & 10). During planting and growing phases, the terraces are flooded and receive a constant flow of fresh water and generous attention by their respective farmers, ensuring that all fields are properly constructed, receiving enough water, draining efficiently, and not hindering water flow. Prior to harvesting, water is completely drained and the rice is left to dehydrate. Post-harvest, the fields are burned to prevent pest infestation and to allow the soil to recharge its nutrients.



Figure 4. Simplified diagram of *subak* water temple and irrigation system.  
Source: Lansing 1983, 170.



Figure 5. The famed *sawah* landscape in Karagasem, eastern Bali.





Figure 6. An example of a *subak* weir diverting one source into multiple canals  
Source: <http://www.panoramio.com/photo/13920> (Accessed: September 3, 2013)

As the Balinese continue to shift from farming to other sources of employment, families typically sell their agricultural lands due to the high real estate demand and large sums of money they can gain. With no fields they abandon their traditional *subak* duties, thus the *sawah* and *subak* infrastructure have suffered greatly especially along road frontages where concrete pedestrian sidewalks are built over the ditches hindering maintenance access. Water distribution in many urban zones has become obstructed as domestic and material waste is thrown into the roadside ditches causing clogs and polluted stagnation of the water. The resulting blowback is apparent during the monsoon seasons from November to March when heavy downpours saturate all existing green space and due to the obstructions within the *subak* infrastructure, Bali's urban zones are highly susceptible to flooding. Modern infrastructural projects have fallen short and are incapable of

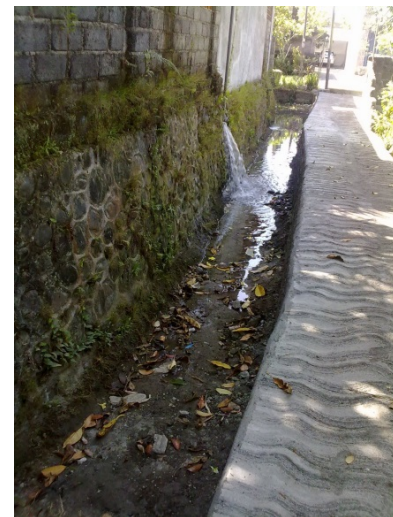


Figure 7. Uncovered *subak* infrastructure within urban zones.

controlling the floods within the urban environment. Furthermore, lack of enforced or voluntary maintenance by the *subak* or government agencies fails to preserve an ancient landscape infrastructure that has shaped Bali's culture, society, and its international fame.

Traditionally, fresh water sources, such as rivers, streams and springs, serve multiple functions for villagers: a water source for drinking and cooking, a public bath and toilet, and a vehicle for the disposal of ritual (and material) waste. Water for domestic use is collected upstream (*kaja*) while bathing and defecation occurs at downstream (*kelod*) locations within the village's section of the river. Men bathe upstream and separately from women, although children may bathe with either sex. These waterways thus become social hubs where men and women interact apart from their daily village and religious duties and where children can freely play, learn, and experience their natural ecosystems. The coastline and beaches are also used as ritual cleansing areas, usually after specific religious ceremonies at the *pura dalem*, when men, women, and children will enter the ocean to cleanse themselves of metaphysical impurities. During these times, small *warungs* are set up to sell drinks, food, and toys to the villagers and the coastline transforms into a vibrant celebration. Unfortunately, as Bali's water systems have become highly polluted within urban areas and the construction of modern toilets within family dwellings, the daily routine of visiting the river and stream is slowly dying to the dismay of older generations.

### **Balinese Social Organizations**

Fundamental to Balinese social life are numerous communal organizations, each completely involved in religious customs. The organizations connect the Balinese people and may overlap several villages depending on type and size. The most important of the organizations are the *banjar* (hamlet groups), the *subak* (agricultural societies), and the *pemaksan* (temple congregations) (Copeland and Murni 2010, 270). Other important organizations include kinship ties (*dadia*), caste, social status, and volunteer groups (*seka*).

### The Banjar

Each *desa* will have varying numbers of *banjar*, or "neighborhood", usually based on the population of the *desa*. Meeting regularly, members of a *banjar* (*krama banjar*) are typically married couples and are responsible for a wide array of civil and religious activities (Howe 2005, 11). Meetings occur at the *bale banjar*, which is divided into three parts following the traditional tripartite order: the *banjar* temple, located *kaja-kangin*, the central secular meeting area, and the kitchen or storage area, which is always located *kelod-kauh* (Eiseman 1990, 9). Each *banjar* owns collective property which includes streets, paths between houses, irrigation and drainage ditches, and public buildings such as the *bale banjar* (Copeland and Murni 2010, 272).

*Banjar* activities range from cleaning public temples, local security, organizing communal village work known as *gotong royong*, to controlling access of village land, and the construction of sarcophagi and cremation towers. The *banjar* also safe keeps and enforces rules for village law (*awig-awig*), and can impose fines or prohibit members from entering temples or taking part in religious ceremonies (Copeland and Murni 2010, 273).

### The Pemaksan

Revolving around the order of the traditional Balinese calendar, a system of ritual practice (*karya*) permeates every aspect of Balinese life and temple membership is obligatory. All Balinese are members of a varying number of temple congregations (*pemaksan*) and most are members of congregations in other, usually nearby, villages due to ancestral origins. As a member, each share obligations to maintain the temple grounds and perform rituals during at religious ceremonies and anniversaries (*odalan*). Women, in particular, prepare intricate offerings (*banten*) of flowers, cloth, and food (Copeland and Murni 2010, 277) and the men prepare food offerings such as barbeque skewers (*sate*) of fish, pork, or chicken and the famous rotisserie pork known as *babi guling*. The *pemaksan* share responsibilities of ceremony preparation, performance, and funding (Copeland and Murni 2010, 229) which is governed by the level or sacredness of the ceremony.

## **Bali's Architectural Typologies**

Geographically, Bali lies eight degrees below the equator and with two seasons, wet and dry, the Balinese enjoy tropical weather year round thus the need for enclosed living and social spaces is unnecessary. Architecturally, this is obvious as the free-standing pavilion within an open courtyard is the predominant building type, allowing for maximum ventilation, light, and protection from the elements. Balinese cosmology and the thought of man as a microcosm within the universe is also reflected in traditional architectural typologies.

Bali's architecture is known globally as the quintessential tropical construct. An architecture of courtyards first made famous by images of exceptionally detailed, well-crafted temples and tropical pavilions built of natural stone and local hardwoods, Bali's architecture soon became a branded luxury commodity as foreign architects reinterpreted the traditional vernacular for Bali's high-end resorts and residential villas. The "Bali-Style" quickly permeated through resort and residential developments around the world especially within tropical climates. Bali's architecture has become synonymous with luxury living, seamless "connection" with nature, and high-quality craftsmanship. However, to the Balinese, their constructs were a complex manifestation and representation of man; a microcosm within the universe, adhering to the cosmological principles of their religion. Balinese village architecture varies regionally from the volcanic highlands to the coast. Wijaya (2002, 14) explains, "the spacious stark villages of the mountain *Bali Aga* culture, with their rows of timber huts, terraced communal spaces and axial-long houses, are radically different from the cruciform settlement patterns of most coast villages, with their walled family compounds and imposing public buildings. . . In the mountain villages one finds striking simplicity—a more 'ethnic' or aboriginal style—in temples and worshipping grounds. On the coast the temple gates are almost gothic, and the temple gardens Indochinese." The regional differences create a wonder amalgam of architectural typologies which are still used today, however due to modern building methods and materials, decreasing natural resources, and rising building costs, the Balinese vernacular has been slightly altered. The following highlights the architectural and landscape typologies of the more abundant coastal and lowland villages



which comprise of the well-known "labyrinthine village-scapes and compounds of gentrified pavilions" (Wijaya 2002, 14).

### Traditional Public Buildings & Spaces

A typical Balinese *desa* contains a village square (*bacingah*) located on the auspicious intersection (pampatan agung) along the *kaja-kelod* and *kangin-kauh* axi. Within the village square are a number of solitary, non-courtyard public structures and spaces where most social activities take place, which includes the village market (*pasar*), meeting pavilion (*wantilan*), signal tower (*bale kul-kul*), and often an empty field (*alun-alun*). The following are images, drawings, and descriptions of these buildings and spaces:

#### Wantilan:

The village meeting pavilion is perhaps the most imposing of all structures within the village center. Constructed with a large two-tiered roof, the semi-religious *wantilan* serves numerous purposes and holds various functions ranging from dance performances to cock fights. As with all Balinese structures, the *wantilan* is built upon a stone plinth and traditionally constructed of timber, however concrete has become more common. Adjacent to the *wantilan*, a large banyan-tree (*beringin*) is usually found wrapped with large cloth at its base, denoting its religious significance.

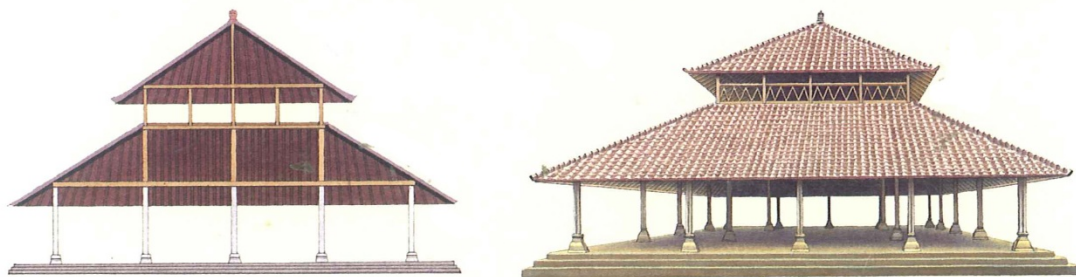


Figure 8.  
Section, elevation (top) and image  
(bottom) of a classic *wantilan*.  
Source: Wijaya 2002, 18,46.

#### Pasar:

The village market is the least formal space within the village; a vibrant chaos of women gossiping, selling and buying freshly harvested vegetables, fruits, and other agricultural

products from the surrounding fields and gardens. Before dawn, women typically line the westerly region (*kauh*) of the *bacingah*, setting up covered or open stalls with their various goods. By early morning the market is deserted as the women tend to other household chores, agricultural labor, or other forms of employment. Today, a rural *pasar* may occupy space within the *bacingah*, however a *pasar* within a more urbanized village or tourist area will occupy buildings, resembling a western strip mall due to vehicular traffic within the traditional *bacingah*.



Figure 9. A typical sight at a local *pasar*.  
Source: [http://www.lumbungbalitours.com/paket\\_rupiah/tours.html](http://www.lumbungbalitours.com/paket_rupiah/tours.html).  
(Accessed August 4, 2012)

#### *Bale kul-kul:*

Each *desa* and most *banjars*, have a watchtower or drum tower located near the *wantilan*. The *bale kul-kul* signals times of ceremony, warning, and village meetings. Typically, the *bale kul-kul* is a small four-post wood pavilion built on a tall, slender, terraced stone base, although there are variations in mountain villages. The drum, hung from the roof structure, is traditionally a hollowed-out tree column with a slit running in the vertical direction. Today, towers within urbanized regions may use megaphones as a sound device, occasionally using the traditional drum for important occasions.

#### *Alun-alun:*

An empty field is usually found in larger village squares, used for large social congregations and recreational purposes such as football.

#### The Courtyard:

The Balinese courtyard is an aesthetically pleasing, yet functional space, ideal for Bali's tropical weather. Daily life revolves around the interior courtyards of the family dwelling compound. Wijaya (2002, 80) illustrates the courtyards are "used for sun-drying (laundry, harvested rice or prawn crackers), for crowded domestic ritual ceremonies, or as impromptu work sites. Verandahs, porches, and open pavilions provide shelter where one can retreat to if it rains or if the sun is too fierce. . . In larger compounds—particularly in the *jero*, *puri*, and *griya* houses of the nobility—the public courtyards are used to entertain guests at times of ritual ceremonies, whereas the family courts are where the servants (*paraken*) and close family members make offerings or generally hole up." Religious performances, which include dance, the *gamelan* orchestra, and trances, take place within the most profane and public courtyards of temples and royal compounds.

The courtyard typology, prevalent in temperate and tropical climates, has been used globally for thousands of years as a way to naturally cool interior spaces in warm weather and physically define outdoor spaces. Perhaps introduced by the Chinese, the ancient Balinese also adopted this architectural typology adding layers of cosmo-religious significance to the design and construction of their dwelling or temple courtyards. Balinese courtyards are enclosed physical constructs of the *nawasanga* mandala, consisting of nine, suggested and not physically indicated, zones ordered by hierarchical levels of sacredness (Tan 1967, 448). A common Balinese compound dwelling will consist of an open courtyard with a varying number of freestanding pavilions and garden space along the edges. Temple complexes (*pura*) and palaces (*puri*) often contain more than one enclosed courtyard, usually in multiples of three, further emphasizing the tripartite organization of spatial hierarchies and order principles known as *tri angga*.

#### Gates:

Large pronounced gates punctuate the wall lined village streets and paths, welcoming

visitors into the family compounds and temple complexes. Courtyard gates are thresholds between the various Balinese microcosms, leading from one mental state to another, clearly evident as one transitions between the multiple courtyard complexes of the *pura* and *puri* (Wijaya 2002, 68). The roofed gate form (*paduraksa*) is commonly used for dwelling and temple gates and greatly varies in size, proportions, and materiality, usually depending on the wealth or aspirations of a family or village. Another gate type common for temple complexes is the symmetrical split gate (*candi bentar*). Today, the split gate has also been used to demarcate regency territories along the main highways.

#### Terraces and Steps:

A striking feature among Bali's public and temple architecture are the flights of stairs and adjacent stepped terraces typically constructed of regionally quarried stone. The steps, leading to an entry gate, serve as a cosmos-religious construct symbolizing ascension and declension between the realms of man and god. The stairs and terraces do serve further purposes within courtyard ritual. Wijaya (2002, 74) comments "the stairs are continue to be used for smashing coconuts at the end of a temple festival, for example, or for 'grandstand seating' during any rituals taking place in the *jaba* (house forecourt). They are also a general village sitting room, with flanking half-walls, called *leneng*."

#### Bale: The Pavilion

The wood framed, thatched roof pavilion is found in all parts of Oceania, Southeast Asia, and Australasia. Linguistically, Indo-Pacific names for the pavilion share a common ancestor as Wijaya (2002, 45) notes the pavilion form is "called the *bale* in Bali, *balai* in the Spice Islands, *hale* in Hawaii or *faré* in Tahiti." Over time and with influences from outside cultures, the Balinese *bale* has evolved from a mere hut to an architecture embedded with complex geomantic rules. These rules (*asta kosala kosali*) are based on a sliding scale relative to the bodily measurements of the *bale* owner, setting the proportions, lengths, widths, and breadths of a *bale*. *Bale* may be open, semi-enclosed or enclosed with non-load bearing walls depending on use, and are commonly referred to by the number of posts.

The Balinese anthropomorphic tripartite hierarchy is also apparent in the construction of the *bale*: the roof representing the head; posts and beams, the shoulders and body; and the foundation, the hips and legs. Although aesthetically attractive, the proportions also reflect a well-designed tropical composition. Sloped roofs efficiently shed rain water to prevent rotting. Low eaves protect from rain and sun. Base foundations, built of raw or dressed natural stone, are built high to prevent flooding during the wet season. However, Wijaya (2002) cites the use of traditional proportions for domestic and commercial architecture is becoming less common as more attention is focused on the ornamentation of the *bale*.

### The Balinese Dwelling Compound

The family compound is essentially a constructed manifestation of the *nawasanga*; an extension of those who inhabit it. Depending on caste and social status, the Balinese use four different names for their dwellings: *pekarangan*, *jero*, *griya*, and *puri* (Tan, 1967, 443-444). The *pekarangan*, the dwelling of a common person, and the *jero*, a nobleman's dwelling, are both single walled-in courtyard compounds. The village priest (*pedanda*) lives in the *griya* adjacent to the village square. The village's royal family inhabits the *puri*, a grand dwelling with multiple courtyards for various functions, each containing a number of *bales*. All dwellings, no matter who lives within, follow the nine-fold division of the *nawasanga*, which is only suggested and not physically indicated (Tan 1967, 448).

Traditionally, a typical Balinese compound consists of a variable number of pavilions (*bale*) organized around a central courtyard (*natah*) enclosed by thick masonry or earthen walls with one small pronounced entrance on the main village road (*jalan*) or secondary alleyway (*gang*). Interestingly, Balinese compounds share a similar architectural vocabulary and numerous spatial qualities with traditional Chinese dwellings, hinting to China's early influences in Bali. Structural components consist of wooden posts set in stone foundations, supporting bamboo or coconut wood beams with a grass-thatch hipped roof (*alang-alang*). Today, most new structures, even temple pavilions, are being constructed of concrete masonry for walls, columns, and beams as it is inexpensive and readily available. Corrugated tin, fiberglass, and ceramic tiles are typically used for

roofing. Bamboo is also widely used for various structural needs due to its sturdiness and quick re-growth. Depending on family wealth and status the *bales* may be highly ornate with intricately carved structural members.

Living in Bali's tropical environment requires protection from rain and sun thus most traditional *bale* are partially open with one or two non-bearing walls. Family compounds are constructed using measurements from the head of the household's body, which are then used by an "architect" (*undagi*) to layout the different spaces and provide dimensions to the various *bale*. The given dimensions are governed by ancient texts called *asta kosala kosali* and *asta bumi*. These manuscripts were written on sacred palm leaves (*lontar*) and in the ancient Javanese language of *Kawi*.<sup>4</sup> *Asta kosala kosali* defined the dimensions and proportions of the compound. *Asta bumi* determined the size, location, and rules of land on which the dwelling was to be built. The compound and the *bale* within are considered an extension of man, thus there is great effort to ensure that the construction of the dwelling is balanced, harmonized, and properly configured for the specific owner.

A single compound houses 'agnatic-related, extended families' (Howe 2005, 10) with each family occupying separate sleeping quarters while the other pavilions are shared. Corresponding to the *nawasanga*, each *bale* occupies a spatial zone related to religious and family hierarchy. The family temple, *sanggah*, is situated in the most sacred (*utama*) zone of the compound, which is in the *kaja-kangin* corner. Walled off from the rest of the compound, the family temple and various other shrines dedicated to different deities and ancestors are built upon a raised earthen foundation, further suggesting the tripartite division. In the *kelod* and usually the *kauh* direction are the rice granary (*lumbung*), kitchen (*paon*), and garbage pit. A thatched gate serves as the entry to the compound (*lawang*), ideally located within the *kelod-kauh* corner of the compound, however location is dependent on the street adjacency. About a meter into the compound a free standing wall (*aling-aling*) is constructed, believed to prevent evil spirits from entering

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<sup>4</sup> See Howe 1983 for information on *asta kosala kosali*, and traditional construction methods and sequences.

(Copeland and Murni 2010, 223). It is ironic that on the opposite side of a *kelod-kauh* wall for one compound is the *kaja-kangin* space of another. The thick earthen wall acts as a physical and meta-physical barrier between the two microcosms.

Generally, the senior family members live in the most *kaja* of the compound pavilions, called the *bale daja* or *umah meten* (Eiseman 1990, 191). Located *kauh* of the *sanggah*, the *bale daja* (from *kaja*) consists of a walled-in room where family heirlooms and other valuable items are stored. The front porch, which faces the *natah*, is often the focus of family activities. Depending on the size and wealth of the family, a Balinese compound could consist of two or more other pavilions. *Bale dangin*, *bale dauh*, and *bale delod* respectively occupy the *kangin*, *kauh*, and *kelod* spaces from which their names are derived. These pavilions are purposed and named depending on the caste, number and need of family members residing in the compound. Typically, sons bring their wives in, while daughters marry and move out to their husband's family's home. When a compound consists of more than one nuclear family, agriculture land is divided and a second granary and/or kitchen may also be built. Sleeping arrangements are somewhat dependent on birth order, the oldest sibling and associated family occupy the *bale dangin*, whereas the youngest sibling will sleep on the *bale delod* or *bale dauh*, or where space permits if a no other *bale* are available. Each family compound is considered a political and social unit within a *desa*.

Today, many newer houses are built resembling western houses, due to the influences of colonial and contemporary villa architecture, condensing the number of *bales* within the compound. Most houses have two or three bedrooms sharing an interior living space and exterior porch. Although constructed using western planning, the customary spatial and social hierarchies still apply within the house.

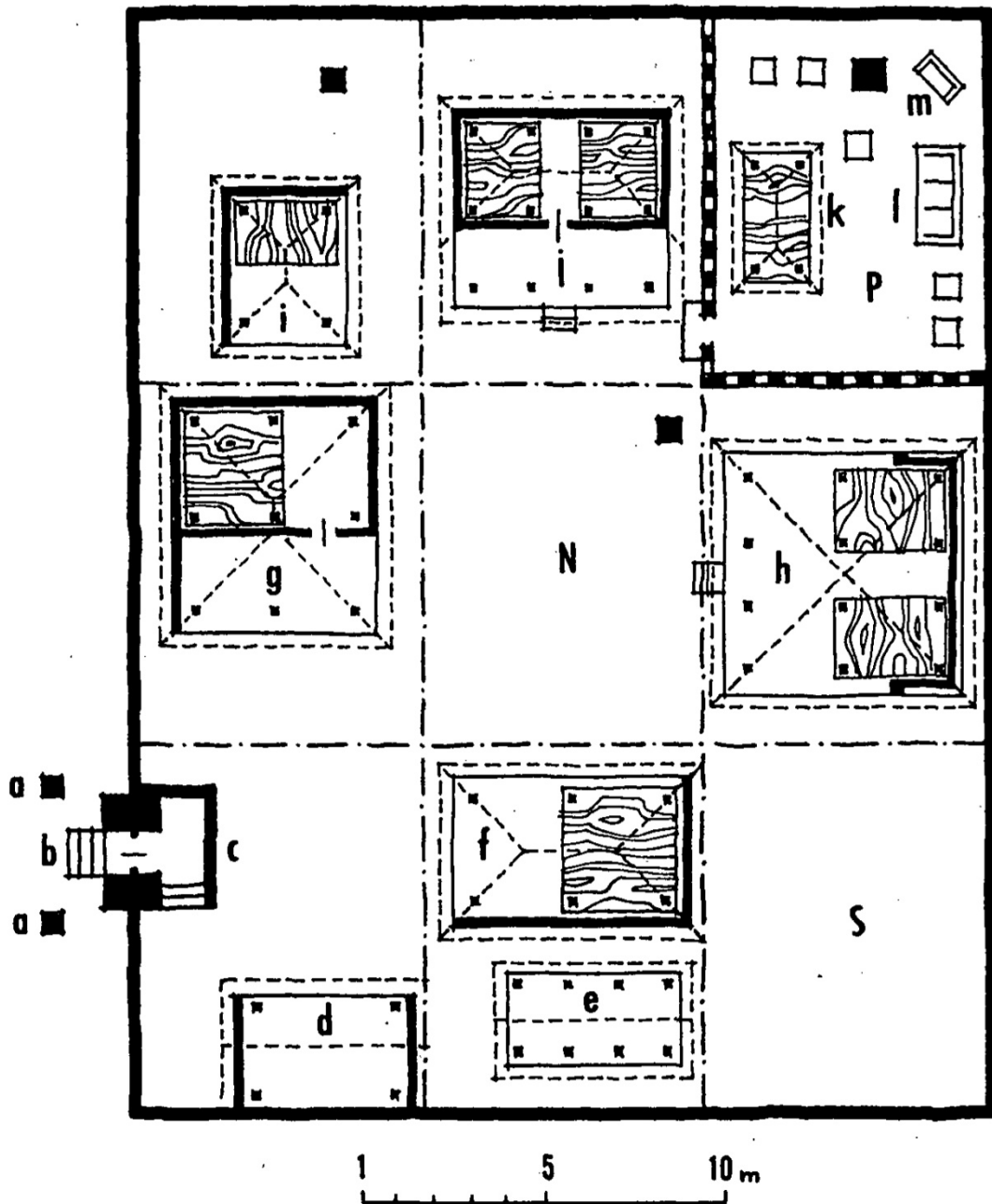


Figure 10. Schematic plan of a family dwelling compound (*Pekarangan*)  
Source: Tan 1967, 447

- |                     |                                |                        |
|---------------------|--------------------------------|------------------------|
| P. <i>pamerajan</i> | a. <i>apit lawang</i>          | h. <i>bale gede</i>    |
| N. <i>natar</i>     | b. <i>lawang</i>               | i. <i>bale sikepat</i> |
| S. Service court    | c. <i>aling-aling</i>          | j. <i>umah meten</i>   |
|                     | d. <i>paon</i>                 | k. <i>bale sesajen</i> |
|                     | e. <i>lumbung</i>              | l. <i>sanggah</i>      |
|                     | f. <i>bale sekenam (delod)</i> | m. <i>padmasana</i>    |
|                     | g. <i>bale tiang sanga</i>     |                        |



## Conclusion

This chapter emphasizes the Balinese necessity and constant struggle of orienting oneself socially, historically, geographically, cosmologically, and religiously in order to maintain a balanced and harmonious relationship with others, the gods, and the environment based on the philosophy of *tri hita karana*. The order, hierarchies, and activities of the traditional village and dwelling compound have been explored, although it is clear that all villages will differ in size, social structure, and have different customs. The complexity of Bali's traditional village institutions such as the *desa*, *banjar*, *subak*, and *pemaksan* have guided the socio-cultural growth of the Balinese as well as shaped the built and natural environments for hundreds of years. Although modernity and globalization have penetrated Bali's unique cultural fabric, the traditional cultural/religious values and beliefs remain resilient. Pratiwi (2002, 279-280) argues "the Balinese institution of *adat*, quite independent from formal government planning and development, continues to shape human environmental relationships within its 'sacred' boundaries. These relationships (i.e. house compound production) have linked human/spiritual health with environmentally sound behaviors.

The chapter also studied the traditional architectural typologies and engineered landscape of Bali. Most of today's "Bali-style" residential, commercial, and hospitality architecture derives its "Balinese-ness" from ornamentation, materiality, and the use of pavilion forms, however, it is the use of proportions measured from the human body and cosmological/geomantic layout that a Balinese compound and the contained structures are judged. Today, the use of modern construction methods and cheaper materials has nearly become a standard building practice: reinforced concrete frame with brick infill and minimal openings; a hipped roof and carved ornamentation are used to preserve the "Balinese style" as required by the Balinese government. In addition to the traditional built village-scape, Bali's engineered terraces of *sawah* by the network of *subak* organizations are a testament of man's ability to harmoniously alter and manipulate the natural landscape into a productive source of subsistence, allowing Balinese culture and society to grow and thrive. However, with an exponential increase of development, the *subak* and *sawah* have suffered as land is converted and polluted water sources irrigate

the terraces. The next chapter explores the exchange of cultural and religious constructs, ideas, and economies that have historically influenced Bali in the past thousand years.

#### **IV. A CULTURE IN FLUX**

##### **Early Influences**

Bali is often considered an unchanging cultural and religious relic; a "museum" of ancient Javanese culture (Howe 2005, 26). However, it is quite the opposite as Degung Santikarma writes: "Bali is not harmonious, homogenous, and static. It is—and has long been—the home of many competing strands of thought and many different ways of being Balinese. It is an ever-changing mosaic, shifting its design to meet new ideas imported from outside" (Reichle 2010, 11). The Balinese culture has in fact been in constant flux, evolving and appropriating ideas and traditions from foreign cultures that at one point had contact with the island. Close in distance to Java, Asia's two main religions, Buddhism and Hinduism, and subsequent languages reached the island. Traders, some of which settled on the island, from the Middle East, India, China, and other sea-faring Southeast Asian cultures greatly influenced the primitive peoples of ancient Bali (Hitchcock and Putra 2007, 13).

Early in the tenth century, the marriage of a Balinese prince, Udayana, and Javanese princess, Sri Gunapriya Dharmapatni, had forged strong political and cultural relations between the ruling kingdoms of Bali and East Java. Yet, over the following three centuries there were conflicts between the two kingdoms; the Balinese asserted their autonomy, which the Javanese Singasari emperors countered by reinstating their authority by force over the island (Hanna 2004, 23-24). The fall of the Hindu-Javanese Majapahit kingdom, which exerted control over Bali from the mid-fourteenth century to 1515, marked the end of Hindu domination in Java and the rise of the Islamic Mataram empire throughout Indonesia.

Fleeing the Mataram conquest, the Majapahit royal family as well as thousands of priests, nobles, artists, and soldiers, migrated to Bali, established their authority and further transfused their respective cultures. Today, most Balinese innately trace their ancestry to this migration of refugees, which is also considered the start of contemporary Hindu-Balinese culture.

## **Colonialism**

Although part of the Dutch colony of Indonesia, Bali was rather unaffected by direct rule unlike its island neighbor Java (Pratiwi 2009, 75). This was mostly due to Bali's lack of spices and other cash crops the Dutch had monopolized during their 300-year rule. Only until the mid-1800s did the Dutch set up direct administrative rule in the northern kingdom of Buleleng, spreading south with battles resulting in the mass suicides (puputan) of two Balinese royal families in Badung, 1906, and Klungkung, 1908 (Hanna 2004, 170). The global press that followed the atrocities severely criticized the Netherland's colonial endeavors in Bali and the rest of Indonesia, forcing the Dutch to reform their colonial ethical policies.

The Dutch began to study the Balinese culture, becoming pioneers in the fields of ethnology, philology, and archaeology (Hitchcock and Putra, 2007, 15). The Dutch viewed Balinese culture as having degenerated, thus measures of cultural preservation "was not so much preserving the culture as they found it, as restoring it to what they thought was its original integrity" (Picard 1996, 21). Implementing a process known as Balinization (Baliseering), Picard explains the Dutch aimed to teach the Balinese the importance of their language, literature, traditional arts, and simultaneously discouraging "any improper expressions of modernism" (1996, 21). Howe suggests that by using this preservation policy, the Dutch "presented Bali as a showcase of enlightened colonial rule . . . however, it also gave them the opportunity to reform Balinese political organization, since in order to revitalize this culture they had to remove certain political obstacles" (2005, 19). The Dutch then made efforts to advertise the island where traditions remain exotic and unchanged due to their hard efforts in "preserving" Balinese culture and benevolent rule.

## **The Beginnings of Tourism**

Tourism in Bali began in 1914, described as the "Gem of the Lesser Sunda Isles" (Howe, 2005, 26). The first tourists arrived in Singaraja by the Dutch government steamship line, the K.P.M. Lured by published photographs, paintings, and drawings of Balinese ritual ceremonies, landscapes, and people, tourism to the island increased, augmented with the

establishment of a regular steamship service in 1924, which linked Singaraja to Surabaya, Semarang, Batavia (now Jakarta), and Singapore (Hitchcock and Putra 2007, 16). During the interwar years, a number of artists, novelists, and musicians chose to live on the island, further adding to the 'image-making' collection of published material. Most notably among the bohemian ex-patriots were German painter Walter Spies and Mexican artist Miguel Covarrubias.

Living a life of luxury among the impoverished Balinese, the bohemians described Bali's rich culture through their recordings of social and religious life, focusing on the colorful arts, rituals, and performances. Purposely overlooking the transformations brought on by the colonial powers, or oblivious to them, "they also saw Bali as an unchanging, traditional culture, so far luckily bypassed by the ravages of western modernity" (Howe 2005, 27). Viewing the Balinese culture as fragile, they feared the marketing and increasing growth of tourism would eventually spoil the very culture they came to love. Thus, Bali faced the paradox of tourism: to fine tune its culture and arts in order to attract tourists for economic prosperity despite the fact that it was risking the degeneration of its culture.

### **Modernity**

The ideal of Balinization of restoring Bali to an imagined period of time did not progress without problems. The process not only conflicted with the modernisms brought by colonialism, but also against Balinese who did in fact wanted to be modern (moderen, Ind.), further reinforcing the fact that Balinese society—religion, cultural, artistic, social, and economic—was always in flux (Howe 2005, 19). Vickers suggests, "the desire to embrace the new was not new" (1996, 9). The Balinese wanted to be educated in modern thinking, explore innovative ideas, develop new economic opportunities, and expand on their forms of art (Vickers 1996). The Dutch considered this mentality dangerous to their control over the island, fearing nationalist movements and assertion of self-autonomy. Thus, the Dutch outlawed movements considered to exhibit 'modern' traits, forcing and teaching the Balinese to be 'properly Balinese' (Howe 2005, 19).

Until the late 1960s, tourism on Bali remained very limited due to inadequate infrastructure compounded by political instability and international warfare. Communist dictator, President Sukarno, who embraced Bali as his favorite retreat destination and realized its economic potential, built the Ngurah Rai International Airport in Tuban, and the Bali Beach Hotel in Sanur in hopes to attract foreign tourists. With the overthrow of Sukarno in 1967 by General Suharto, Indonesia under the New Order (Orde Baru) re-opened its doors to the West, encouraging international tourism as a way to address its national economic deficit (Picard 1990, 41). Bali, described as the “last paradise” on earth, would be the focal point of Indonesia’s tourism development.

### **The Green Revolution**

In the 1960s, faced with poor crop supplies nationally, Indonesia implemented the “Green Revolution,” which utilized western agriculture science in order to maximize harvest yields with the use of genetically modified seeds. The function and power of the water temples and *subak* were unknown to the planners involved, regarding agriculture as a purely technical process. The Balinese farmers were forced by government mandate to switch to the high yield rice varieties, which were predicted to lead to three harvests a year, instead of the two of the traditional varieties. Farmers were encouraged to use fertilizers and pesticides subsidized by government programs. After the “Green Revolution” started, the farmers continued performing their rituals, but they no longer coincided with the timing of rice-farming activities. Soon after the introduction of the high-yield rice using western farming conventions, a plague of pests plagued Bali’s rice production. A new pest-resistant variety was introduced, but then a new pest plague hit the farmers. Furthermore, there were problems of water shortage as the *subak* irrigation methods were dropped.

During the 1980s, an increasing number of farmers wanted to switch back to the old system, but the engineers interpreted this as religious conservatism and resistance to change. Lansing (1991) unraveled the function of the water temples and was able to convince the financiers of the Green Revolution project on Bali that the irrigation was best coordinated at the level of the *subaks* with their water temples. As farmers transitioned

back to the traditional *subak* management of water, a cultural heritage was saved.

### **Developing Tourism**

With the advice of the World Bank and funded by the United Nations Development Program (UNDP), the Indonesian government commissioned a French firm, Societe Centrale pour l'Equipement Touristique Outre-Mer (SCETO), to develop the Bali Tourism Master Plan (Pratiwi 2009, 90). The master plan was first published in 1971, approved by the Provincial Assembly of Bali in 1973, and later revised by the World Bank in 1974 after a critical study into the impact of tourism on Balinese society. The proposed master plan restricted tourism to three areas in Southern Bali: Nusa Dua, Sanur, and Kuta. Nusa Dua would be a 425-hectare pre-planned tourist estate with large high-end resorts, while Sanur and Kuta would cater to smaller developments within the existing village settlements. Various institutional and management arrangements to guide and control tourism investment and development were proposed. Developments included improving the road network and construction of the Ngurah Rai bypass, allowing direct access from the three tourism centers to the airport and main tourist attractions around the island. The mentality was to prevent tourism's adverse effects on the local community, thus limiting contact between locals and tourists. The master plan also outlined general building guidelines, mandating the use of local building materials and construction methods to promote traditional Balinese architecture. Building height was limited to fifteen meters, or about the height of a coconut tree, and access to the shoreline for locals was to be required. However, Pratiwi (2009, 92) explains, "the master plan completely misjudged the real market for development, resulting in the rapid and almost completely 'unplanned' development of Kuta."

Due to height restrictions, lack of detailed building regulations regarding setbacks, and construction of "tourist routes," unrestrained ribbon development along road frontages radically changed the image and identity of traditional settlements, often concealing the natural beauty of the surrounding environment. In addition, current urban development has not thoroughly engaged or integrated the *subak*, as most roadside canals and ditches are enclosed with concrete and used as sidewalks. This fundamentally erases any visual

and tactile experience with an ancient infrastructure that is very much relevant to the understanding of the history and root of Balinese culture. With little cooperation between government agencies, controlling the rampant development proved to be difficult, as is the case today.

### **Cultural Tourism**

Tourism has been a great energy of modernization, locking Bali's past as a 'frozen' tradition (Vickers 1996, 25). Economic development focused on the modernization of tourist facilities, contrasting with Bali's need for traditional cultural "objects" (obyeks, Ind.). Balinese temples, rituals, dances, and other cultural practices have become objectified as tourist attractions. The Balinese found themselves within a paradox; to be modern by living a traditional life in order to attract tourism. Picard (1990, 42) explains “on the one hand, the artistic and religious traditions which made the name of Bali famous the world over provided the main tourist attraction of the island. But on the other hand, the invasion of Bali by visitors originating from different horizons was seen as a threat of cultural 'pollution' (*leteh*),” which would lead Balinese culture toward a 'touristic culture' in order to satisfy the desires of the visiting tourists. In order to prevent the threat of cultural degradation, the government formulated a doctrine based on Cultural Tourism (Pariwisata Budaya) (Picard 1990, 42), which would highlight Balinese culture as the main tourist attraction in turn using the economic benefits of tourism to foster Balinese culture. Vickers (1996, 28) suggests that due to the policy of Cultural Tourism, many Balinese have opposed the idea that tourism is a threat to culture, instead arguing that it is a phenomenon reinforcing and augmenting Balinese culture; allowing a proliferation of the arts and addition of "invented" rituals. Picard (1990, 37-38) also adds that the Balinese are “taking what they want, but they are not allowing themselves to be any the less Balinese.”

The idea of remaining unchanged as a “living museum,” spurred discussions on the mentality and future of Bali and its society. Vickers (2012, 299) explains, “not wanting 'to change Bali' may come from a number of causes: nostalgia for a Bali when traffic jams did not exist and life was simpler; or perhaps the idea that change always comes



from the outside; or perhaps again the idea that there is some kind of cultural essence that can be preserved. For many Balinese the cultural essence is related to the features of Cultural Tourism, the dominant way of discussing culture as viewed by an outside 'them,' and consisting of temples, ceremonies, rice fields and people walking around in traditional dress. To maintain this 'unchanged' cultural essence people are constantly renovating temples in grander and grander materials and style, holding bigger and bigger ceremonies, converting their rice fields into plots of land on which to build, and making 'traditional dress' the uniform for hotel employees. Changing in order not to change is the island's biggest dilemma."

### **Tourism Today and Beyond**

Today, Bali welcomes nearly three million foreign visitors and five million domestic (Indonesian) visitors annually; a figure that has doubled over the past decade. Tourism continues to solidify itself as Bali's predominant industry, comprising nearly 66% of the island's total economy. However, Bali faces the growing issue of staying relevant and innovative as other Southeast Asian countries, such as Singapore, Cambodia, and Vietnam, boost their tourism industry and compete for visitors. The installed policies of Cultural Tourism have not been able to deal with the effects of globalization and rapid growth of tourism. In fact, most tourists see very little of Balinese culture as resort tourism supersedes Cultural Tourism as Bali's main industry driver (Vickers 2012, 303). Thus, marketing Bali has become a challenge as tourists from different parts of the world have different expectations of what a Balinese experience entails. A recent proposal by the Indonesian government to introduce sports tourism to Bali has made headlines, with ideas of constructing a Formula 1 race circuit and multiple sports stadiums, to attract a wider range of tourists (Balidiscovery.com 2012).

Due to limited impressions of Balinese culture and increased attention to images of the lavish lifestyles of expatriates, tourist expectations shifted towards self-contained accommodations leading to the villa industry of the 2000s. Due to the shift, Vickers (2012, 304) explains, "the resorts and villas have led to over-development, and cultural and social relations have strained, along with the infrastructure." With global attention on

sustainability and environmental awareness, a small but growing niche of “Eco-Tourism” and “Agro-Tourism” complemented Cultural Tourism, focusing on Bali’s traditional rice cultivation and *subak*. This in turn spurred heavy criticism and scrutiny on the state of Bali’s natural environment. Problems of water shortages, lack of waste and sewage management, and highly polluted streets and rivers, reflect Bali’s lack of planning and incapability of managing development especially in the tourism and commercial sector. News articles highlighting the pollution claimed Bali has lost its charm, describing it as a “Paradise Lost” unable to reverse the environmental degradation (Balidiscovery.com 2012). The headlines spurred debate among Balinese intellectuals, cultural authorities, and government officials about the future of tourism and its planning in Bali, as well as its effect on Balinese culture. Vickers (2012, 309) concludes “Balinese culture is not necessarily in need of preservation, since it is dynamic and highly adaptable. Bali as a physical space defining cultural origins, however, is not in good shape. If there is to be a preservation of Balinese culture, then it needs to be a physical action as much as an intellectual one.”

## **Conclusion**

This chapter has tracked the numerous cultural, political, economic, and social influences and exchanges of Bali throughout its history. Although there is a fear of loss of culture due to the introduction of foreign ideas, modernization, and globalization, this chapter reinforces the fact that Balinese society, culture, and religion have been resilient with the changes of time.

## V. CULTIVATING A CITY

"The city, for all its importance, can no longer be thought of only as a physical artifact; instead, we must be aware of the dynamic relationships, both visible and invisible, that exist among the various domains of a larger terrain of urban as well as rural ecologies." - Mohsen Mostafavi (2010, 33)

It is clear and inevitable that tourism-driven development, whether in rural towns or burgeoning cities, will alter the traditional urban form. This is partly due to modern practices of urban planning and design, as well as the westernized universalization of construction methods and technologies (Frampton 1983). Bali, as a global destination, has relied on its natural paradise and unique culture to attract visitors yet Bali's society, religion, and culture have been able to adapt to the influences of modernization and globalization. Its built and natural environments, largely in the tourist and commercial regions of the island, have undergone major transformations that have deteriorated the unique identity of Bali's traditional village-scape and engineered landscape. If Bali is to secure its global spotlight, its politicians, designers, investors, and all stakeholders, especially the common Balinese, will have to critically question and analyze what a modern Balinese city and landscape is and could be. Place-making and enhancing an authentic identity must be based on a strong cultural and geographic bearing as Lynch (1960, 5) explains, "a distinctive and legible environment not only offers security but also heightens the potential depth and intensity of human experience."

Current urban conditions in Kuta, Bali have struggled to accommodate the extraordinary economic and population growth of the region spurred by the tourism industry. Once serene village pathways have been modernized and paved into roads with congested vehicular traffic crippling the traditional ambulant village lifestyle. The use of the original compact path widths and the absence of setbacks and pedestrian friendly walkways have made Bali's roads dangerous and void of communal use. The sale of verdant fields of *sawah* for infrastructural, domestic, and tourism industry development projects have heavily degraded the natural environment as natural ecologies are obstructed by buildings and roads. Land use zoning in Bali has been based on economic

rationale: profit and speculation, quantity instead of quality, and void of any cultural sensitivity. Recent infrastructural projects in Kuta, such as the Simpang Siur Underpass and the Bali Toll Road, have focused solely on the alleviation of vehicular congestion, a common complaint from visitors and the domestic population, with little thought to facilitating pedestrian access. These government planned projects, however necessary, lack a progressive and holistic approach to planning and developing Bali's urban, natural, and cultural environments. A destination will not survive without an identity. This chapter explores the challenges of urbanism for Bali.

### **Image and *Genius loci***

Place is a cultural construct that is manifested and defined by its inhabitants. The appreciation of a place stems from the perception and quality of its spaces and landscapes. How we remember a place, whether a neighborhood, village, town, or city is usually perceived by the external visual appearance or image through landmarks, nodes, paths, districts, and edges (Lynch 1960). The term *genius loci* has been used, although its meaning has evolved over time, to describe the quality of a place as J.B. Jackson (1994, 157-158) describes: “Sense of place’ is a much used expression, chiefly by architects but taken over by urban planner and interior decorators and the promoters of condominiums, so that now it means very little. It is an awkward and ambiguous translation of the Latin term *genius loci*. In classical times it means not so much the place itself as the guardian divinity of that place. ... in the eighteenth century the Latin phrase was usually translated as ‘the genius of a place’, meaning its influence. ... We now use the current version to describe the atmosphere to a place, the quality of its environment. Nevertheless, we recognize that certain localities have an attraction which gives us a certain indefinable sense of well-being and which we want to return to, time and again.”

The "character" of a place evokes a reaction and an emotional experience. Thus "character" and *genius loci* have commonly become attached with each other in discussion regarding urban design. "The past" is typically the notion upon which *genius loci* is described, as “it exists as both an individual and collective construct, with shared values and experiences being important within cultural groups” (Jivén and Larkham,

2003, 69). Thus, the form and history of place is closely linked with group identity, which creates a sense of place, the *genius loci* as Conzen (1966, 56-57) suggests: “in the course of time the landscape, whether that of a large region like a country or of a small locality like a market town, acquires its specific *genius loci*, its culture- and history-conditioned character which commonly reflects not only the work and aspirations of the society at present in occupancy but also that of its precursors in the area.”

Norberg-Schulz describes *genius loci* as “representing the sense people have of a place, understood as the sum of all physical as well as symbolic values in nature and the human environment,” distinct from the terms "sense of place", "character", and "appearance" commonly and synonymously used (Jivén and Larkham, 2003, 70-73). Using the concept of townscape, he believes that the skyline of a town and horizontal silhouette of its urban buildings are essential to the image of a place, promoting the traditional form of towns and buildings which exude a symbolic understanding of places. This understanding refers to the appreciation and awareness of the natural conditions of a place such as the landscape's topography and cyclic changes of light, atmosphere, and vegetation. Man's response to the elements of nature in the construction of buildings and settlements represent a cultural interpretation of place, a vehicle for man to orient and identify themselves within the world.

How can we describe the *genius loci* of a Balinese village, town, or city? I believe based on Norberg-Schulz' definition, the *genius loci* of a Balinese village can be understood as the physical manifestation of the cosmological and geomantic principles that aim to harmonize man's existence within the universe, influenced by complementary seen (*sekala*) and unseen (*niskala*) forces. The cosmo-religious tripartite hierarchy, the *tri angga*, describes, organizes, and divides all things as sacred (*utama*), neutral (*madya*), or profane (*nista*). The geomantic and topographical orientation of the *nawasanga* mandala is applied to the location, layout, and construction of villages, temples, palaces, and domestic dwellings. Power, whether religious, cosmological, or political, is found at the center (*puseh* or *tengah*) of these built manifestations of the *nawasanga*; the village square (*bacingah*), central courtyards of the *pura*, *puri*, and *karang*. However, if we shed

Bali of its cosmo-religious layer it is apparent that the Balinese demonstrate an in-depth understanding, mastering, and respect of the island's tropical climate and natural resources upon. The island's engineered landscape, the undulating and stratified layers of wet rice terraces (*sawah*) managed by the ancient *subak* society and system add to Bali's *genius loci* as a cultural landscape which has supported the thriving society for over a millennium. The vernacular typologies of Balinese architecture effectively addresses the tropical hot and humid climate: the courtyard and *bale*; wooden post-beam pavilions built upon raised foundations addressing monsoon floods, with low-eaves and hipped roofs to shed rain water away and provide needed shade from the sun, typically open or semi-enclosed by non-bearing walls to allow for ventilation. The traditional village-scape, or town-scape as Norberg-Schulz coins, consists of wall lined avenues and alleys, flanked by drainage canals and punctuated by large hip-roofed gates marking the entrance to dwelling compounds, or split stone gateways at temple complexes. Where major avenues meet, we find the central village square and associated traditional public spaces and structures. As the Balinese built and natural environment evolves due to advancements in construction technologies, modernization, globalization, and personal ambitions, desires, and tastes, we would expect that the *genius loci* of Bali would as well. How can a Balinese village evolve into a Balinese city without sacrificing its cultural and religious essence?

### **Landscape Urbanism: A Catalyst for City Formation**

In the past decade, the use of landscape as a model for contemporary urbanism has spurred a multitude of imaginative and innovative built and un-built projects. Landscape architect James Corner (Waldheim 2006, 23) cites "the reappearance of landscape in the larger cultural imagination is, in part, to the remarkable rise of environmentalism and a global ecological awareness, to the growth of tourism and the associated needs of regions to retain a sense of unique identity, and to the impacts upon rural areas by massive urban growth." Traditionally, urban landscape planning and design has emphasized an interest in site-planning, flora, and earthwork, guided by the use of the oppositional figure/ground plan, "which fails to engage the material aspects of a site, representing the ground as a void around buildings" (Waldheim 2006, 127). The ground or "nature" is represented as a

relief from urban congestion, pollution, and claustrophobia in the form of parks, greenways, tree-lined streets, and gardens. The belief that such environments would benefit the city's health, civility, economy, and social harmony clashed with post-modern critiques of modernist architecture and planning, which blamed the rigid ideologies of modernism for its "inability to produce a 'meaningful' or 'livable' public realm" (Waldheim 2006, 38).

In contrast to modernist urbanism, Kenneth Frampton initially argued for an architecture of local "resistance" against forces of "optimized technology" and global culture (Frampton, 1983). A decade following Frampton's initial argument, his position shifted slightly as he suggests "priority should now be accorded to landscape, rather than freestanding built form" (Frampton 1995, 90). Contemporary theories of landscape urbanism surpass the aesthetic and "offers an implicit critique of architecture and urban design's inability to offer coherent, competent, and convincing explanations of contemporary urban conditions . . . in which landscape supplants architecture's historical role as the basic building block of urban design" (Waldheim 2006, 37). Landscape urbanism aims to drive future urban development by holistically theorizing sites, territories, ecosystems, networks, and infrastructures based on the complex processes of urbanization as an alternative to rigid modernist planning. Corner (Waldheim 2006, 28) outlines four themes upon which he believes the practice of landscape urbanism may be based: "processes over time, the staging of surfaces, the operational or working method, and the imaginary." He argues that the "processes of urbanization—capital accumulation, deregulation, globalization, environmental protection, and so on—are much more significant for the shaping of urban relationships than are the spatial forms of urbanism in and of themselves." Landscape urbanism shifts attention from the object qualities of space to the different processes or systems that influence the city's formation; systems of complex and dynamic natural, cultural, economic, political, and social relationships.

All life on the planet is bound into dynamic relationships. To define and explore the individual agents within complex spheres of operation that cumulatively affect and influence the evolution of an environment, ecology has become an "useful lens which to

analyze and project alternative urban futures" (Waldheim 2006, 29). Mostafavi notes "in one sense the 'project of urbanism' . . . runs counter to that of ecology, with its emphasis on the interrelationship of organisms and the environment—an emphasis that invariably excludes human intervention" (2010, 17). Ecology has been typically used in the context of the "natural environment" and somewhat exclusive of the built city, focusing on the natural systems and biodiversity of a region. However, in the same sense that rivers and forests are natural ecological vessels, cities and infrastructures, the built results of urbanization, can be examined as man-made ecologies. Corner (Waldheim 2006, 30) admits "we have yet to understand cultural, social, political, and economic environments as embedded in and symmetrical with the 'natural' world." Various ecologies, whether natural or man-made, seemingly chaotic or complex, comprise of highly structured hierarchies of order; each agent having the ability to affect an entire system. Corner further suggests "the promise of landscape urbanism is the development of a space-time ecology that treats all forces and agents working in the urban field and considers them as continuous networks of inter-relationships." An entire city can be viewed as Petri dish of processes and exchanges, with a constant flux of activities, bio-diversities, and patterns of occupancy formed by various forces and relationships.

Highlighting the design trend of utilizing landscape as a framework for urbanism, numerous international cities have started to invest in revitalizing the natural ecosystems that have been neglected and degraded due to urban growth. A popular focus of this urban design trend has been urban water sources, such as rivers, streams, lakes and mangroves, which has been a proven catalyst for the creation of functional and attractive community and urban spaces. However, the re-engagement and naturalization of water bodies in the urban fabric requires a keen understanding of a region's water ecological and hydrological properties.

### **Water: Ecology, Hydrology, and Infrastructure**

Water is undoubtedly Earth's most valuable and important natural resource. The volcanic geology of Bali contributes to its high quality of fresh water. Water evaporated from the ocean surrounding the island is pulled by seasonal winds into the central mountains,



where it is emptied into the dynamic watershed. The rain is filtered by layers of vegetation and porous volcanic soils and rock as it percolates to recharge the fresh groundwater table. If the grounds are too saturated, the rain waters swell numerous streams and rivers before emptying back into the ocean loaded in nutrients which enriches the island's marine ecosystem. The island's dynamic, complex, and connected natural ecosystems, such as the rainforests, mangrove forests, and surrounding ocean, have evolved around and are highly dependent on the island's hydrological system, reinforcing the fact the island is vulnerable to any forces that manipulate the flow and quality of water. Any disruption in highland flows will be compounded at the coast. The Balinese are aware of this as apparent in their traditional *subak* system with which the flow of water has been efficiently managed from source, through the *sawah*, finally out to the sea.

Developing islands and societies, such as Bali, struggle to preserve natural waterways and conserve ground water supplies in the sake of economic growth which counters the culture's fundamental religious view and respect of the life element. Urban development and sprawl has had a detrimental effect on the island's hydrological and ecological systems; groundwater is tapped at a rate faster than its being recharged lowering the groundwater table level which induces salt water intrusion at coastal margins; augmenting the amount of contaminated surface runoff into rivers and streams; and destroying natural habitats for the flora and fauna. It is only until recent history have the rivers of Bali been too polluted to use and enjoy due to surface runoff from roads, pesticide and fertilizer contamination, human and animal fecal waste, and material matter, especially plastic. Compounded by the effects of global warming, over a third of the island's rivers run dry during the dry season and during the monsoon season, flooding is prevalent as urban infrastructure is overwhelmed.

Modern infrastructure built to deal with water in urban centers typically results in the transformation of natural waterways into utilitarian concrete channels void of life. One such example would be the Los Angeles River. However, an increase in public awareness of urban water quality and flow has shifted urban design to utilize nature as an

infrastructure. Nature-based urban hydrological infrastructure and technologies include, but are not limited to, bio-swales (Fig. 11), cleansing biotopes, and bio-engineered rivers and streams. Constructed strategically near vehicular infrastructure, the bio-infrastructure collects and controls surface run-off which is filtered by a combination of plants with cleansing properties, geo-textiles, and various sized aggregates and soils. Depending on the needs and desires of the city, the filtered water can recharge the groundwater in place, be piped to reservoirs for later municipal use, or simply emptied back into the river or ocean. Besides serving the function of filter for polluted water, the infrastructure promotes habitat restoration and landscape beautification.

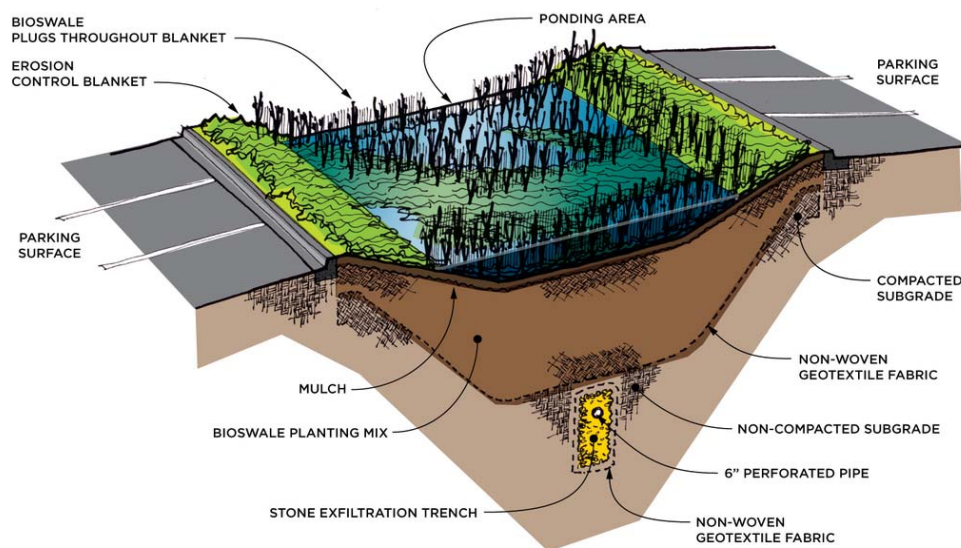


Figure 11. A bio-swale illustration.

Source: <http://archinect.com/conradgartz/project/bioswale>  
(Accessed November 2, 2013)

## Precedents

A very notable water-based urban revitalization project is the Cheonggyecheon in downtown Seoul, South Korea. Initially met with public criticism due to the implications, fear of the unknown, and costs (~US\$280 million) of such a huge construction project, it was met with praise upon its completion as a popular destination for city residents and tourists. The Cheonggyecheon is a 6-kilometer creek flowing west to east through the bustling city. Historically, the streambed was dry during fall and spring, and prone to flooding during winter and summer seasons. After the Korean War, a huge influx of migrants moved into Seoul settling along the stream in makeshift stilt-houses. Trash and wastewater soon polluted the waterway and it became an eyesore and health hazard to Seoul's inhabitants. Following the post-war economic success of South Korea and resulting modernization and urban development, the stream was covered with concrete to serve as a drainage system over a span of twenty years. Completed in 1971, a 5.6-kilometer long, 16 meter-wide elevated highway was built above the drainage canal and the area became the urban heart of Seoul. After nearly three decades, the Seoul government led by former mayor Lee Myung-bak initiated a major project to remove the elevated highway and restore the stream.



Figure 12. Before (left) and after (right) of the Cheonggyecheon stream restoration.

Source: <http://www.kcet.org/socal/departures/landofsunshine/la-river/from-freeways-to-waterways-what-los-angeles-can-learn-from-seoul.html>

(Accessed September 3, 2013)

The restored stream was opened in September 2005. The Cheonggyecheon is lauded as a successful urban renewal project with its integration of civic and landscape infrastructure

into one holistic system. As a civic space, the stream now offers paths at different elevations as well as gathering and performance spaces, which allow the city users to engage the stream. The surrounding businesses have also felt a positive impact with an increase of pedestrian activity. The project has also decreased the number of vehicles entering the area, while increasing the number of users of public transportation (i.e. bus and subway). Environmentally, the project has had a huge impact: the number of species of fish, birds, and insects has increased due to habitat restoration, ambient temperature of spaces around the stream has cooled with an increase of wind flow through the area, and the water quality of the stream is excellent and safe to play in ([www.terrapass.com](http://www.terrapass.com)). The Cheonggyecheon has become the center for cultural and economic activities in Seoul, and serves as a precedent to other cities looking to revitalize their urban natural ecosystems.

Another recent river-based, urban redevelopment project that focuses on integrating ideas of recreational, hydrological, and ecological infrastructure is Bishan-Ang Mo Kio Park on the equatorial island nation Singapore. Bishan-Ang Mo Kio Park, one of Singapore's most popular and biggest parks and centered geographically on the small densely populated island, was originally constructed in 1988 and is located along a portion of the Kallang River which had been converted into a large concrete drainage canal, typical of Singapore's waterways in order to control monsoon flooding. In 2006, Singapore's government agencies, the Public Utilities Board and National Parks, launched the Active, Beautiful, Clean Waters (ABC Waters) Program with the intention to transform the nation's water bodies beyond their civic functions of storm water drainage and water supply into beautiful and clean rivers and lakes with new public spaces and amenities. Under the long-term initiative with over a hundred locations phased for redevelopment by 2030, Bishan-Ang Mo Kio Park is the flagship projects bringing Singapore's citizens closer to the river. The design process challenged multiple government agencies, designers, engineers, and bioengineering specialists, even horticulturalists, to holistically engage the river, park, and surrounding residential properties into an active living site. Mr. Herbert Dreiseitl, founder and partner from Atelier Dreiseitl Asia, the lead design firm, describes the project concept "as a strong new impulse for the future, an infrastructure that can be appreciated and accessed by citizens which at the same time

respects the environment in a sustainable manner also brings about a subtle change in behavior and thinking," he adds on, "and it is through this change that we can begin to create places which are vibrant, healthy and full of socio-cultural liveliness. Bishan-Ang Mo Kio Park has already the beginnings of this, and bringing the river and water element back to the people, will further enhance the place." ([www.nparks.gov.sg](http://www.nparks.gov.sg))

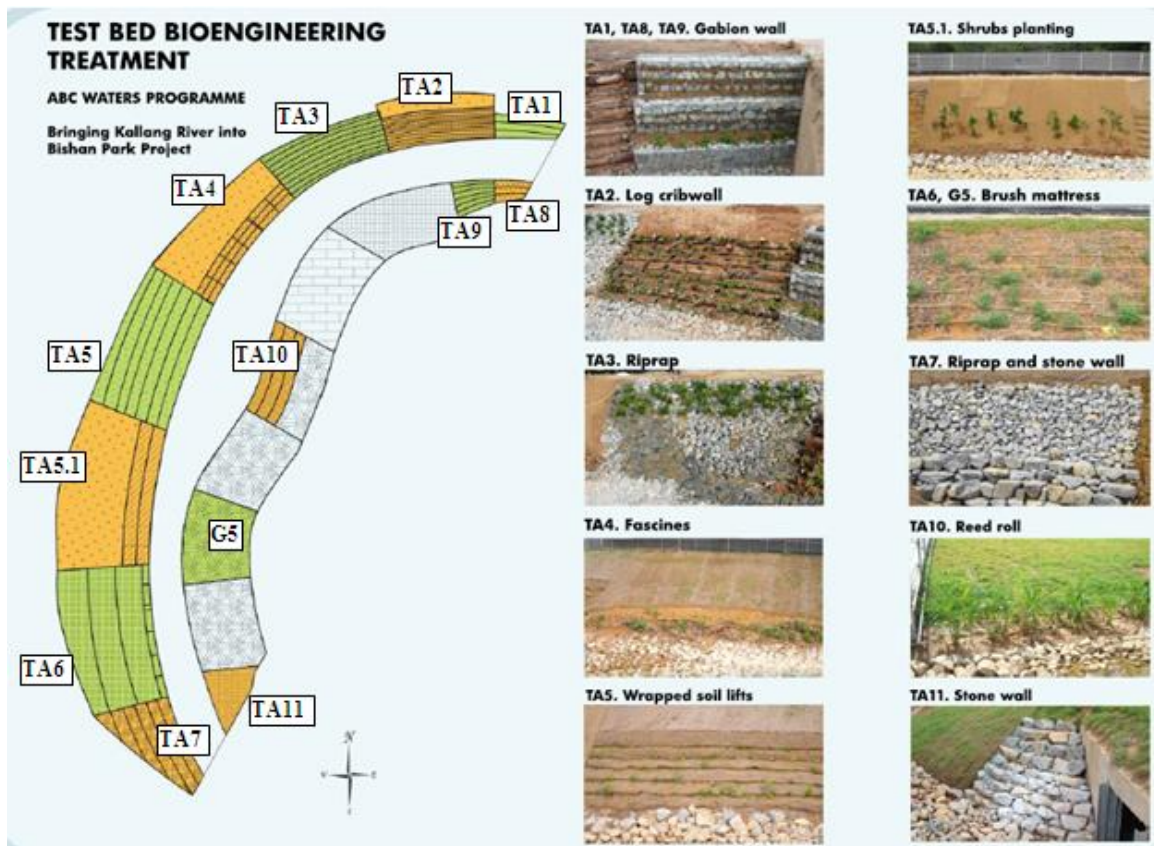


Figure 13. Bishan-Ang Mo Kio test bed examples  
Source: <http://www.pub.gov.sg/abcwaters/Publications/Pages/KallangRiver.aspx>  
(Accessed September 3, 2013)

In order to transform the drainage canal, the intensive collaboration resulted in water system that utilized bioengineering techniques, unprecedented in the tropics, in order to create a natural river with landscaped banks, combining aesthetics and soil retention function. After a year of testing ten different combinations in a constructed sixty meter test bed of various vegetation and natural materials with traditional civil engineering techniques, seven were used in the final construction which include fascines, rip-rap with cuttings, geo-textile wrapped soil-lifts, brush mattresses with fascines, reed rolls, planted



gabions, and geo-textile with plantings. In addition to the bio-engineered river way, a cleansing biotope, also known as a constructed wetland, was designed as an effective method of treating onsite water without the use of potentially harmful chemicals, while beautifying the existing natural environment and promoting habitat restoration. Located upstream within the park, carefully selected plants planted within a terraced filter medium cleanse the water by filtering pollutants and absorbing nutrients. An ultraviolet (UV) treatment system is also used to eliminate any hazardous biological contamination. Integrated into the hydrological infrastructure, a number of new public facilities were constructed which include a river promenade for events, community gatherings, and festive celebrations, themed playgrounds, and exercise areas that encourage the physical engagement of the river. A beneficial result of re-naturalizing the river was the creation of a great variety of micro-habitats which has spurred a 30% increase in the park's biodiversity including birds, insects, reptiles, and small river fish. Like the Cheonggyecheon project, Bishan-Ang Mo Kio Park has become a successful precedent upon which future river and water-based urban and ecological revitalization developments can be compared.



Figure 14. Before (left) and after (right) of the Kallang River and Bishan-Ang Mo Kio redevelopment.

Source:

[http://upload.wikimedia.org/wikipedia/commons/6/67/Before\\_and\\_After\\_Aerial\\_View\\_of\\_Kallang\\_River.jpg](http://upload.wikimedia.org/wikipedia/commons/6/67/Before_and_After_Aerial_View_of_Kallang_River.jpg)

(Accessed September 3, 2013)

## Conclusion

This chapter explored contemporary theories of urban design, applications of landscape as a catalyst for water-based urban development, and precedents of water-based urban

revitalization which have the potential to influence future developments along the Tukad Mati River in Kuta, Bali. Critical to Kuta's urban progression is remaining true to the Balinese religious philosophy of *tri hita karana*, properly balancing man within the built, natural and metaphysical worlds.

## VI. KUTA

### Geography and Physical Conditions

Kuta, Bali is Indonesia's most popular tourist destination. Located along the southwest coast of the island, it has grown from a quiet fishing village into a bustling commercial center. Kuta is one of five villages (*desa*) in Kecamatan Kuta, a sub-district of Badung Regency (Kabupaten). It is located nine kilometers southwest of Bali's capital, Denpasar. The total population in Kecamatan Kuta in 2010 was 39,809 (Kecamatan Kuta Dalam Angka 2011). Of the total population, 12,337 reside in *Desa* Kuta which has an area of about 7.23 km<sup>2</sup>, averaging a density of 1,706 persons/km<sup>2</sup>.



Figure 15. Sub-districts (*Kecamatan*) of the Badung Regency (*Kabupaten*)  
Source: Google Earth

Geographically, Kuta is a lowland coastal area, with an elevation range from 2.5 to 9 meters above sea level. Because of its southern location near the Bukit peninsula, the area is especially hot and humid. Southeasterly trade winds remediate some of the daily heat during the dry-season (*musim panas*) from May to September, and southwesterly monsoons drench the island with a monthly rainfall average of 300mm during the wet season (*musim hujan*) from October to April.



Kuta is trisected in the north-south direction by the main streets of *Jalan Legian* and *Jalan Raya Kuta*, extending from Ngurah Rai International Airport in the south to the border between Kecamatan Kuta and Kecamatan Tabanan in the north. *Jalan I Gusti Ngurah Rai*, *Jalan Sunset Road*, and the Tukad Mati River, which run parallel to, and east of the main streets frame the limits of development within Kuta. Kuta's traditional village-scape has been severely suppressed as domestic residences, temples, and other public spaces are surrounded by tourism and commercial developments and activities which dominate the western section of Kuta, due to its location to the beach. The pre-existing village residential core and much of the village facilities such as the markets, banks, and temples, are located near the intersection of *Jalan Pantai Kuta* with *Jalan Legian* and *Jalan Raya Kuta*, which is considered to be the traditional village center. With real estate along Kuta's coast, the eastern section of Kuta is undergoing rapid development spreading east of the Tukad Mati River towards *Jalan Sunset Road* and beyond. This area is predominantly industrial and commercial along street fronts, with pockets of migrant and domestic slum-esque residences as well as a growing number of villa and hotel developments.

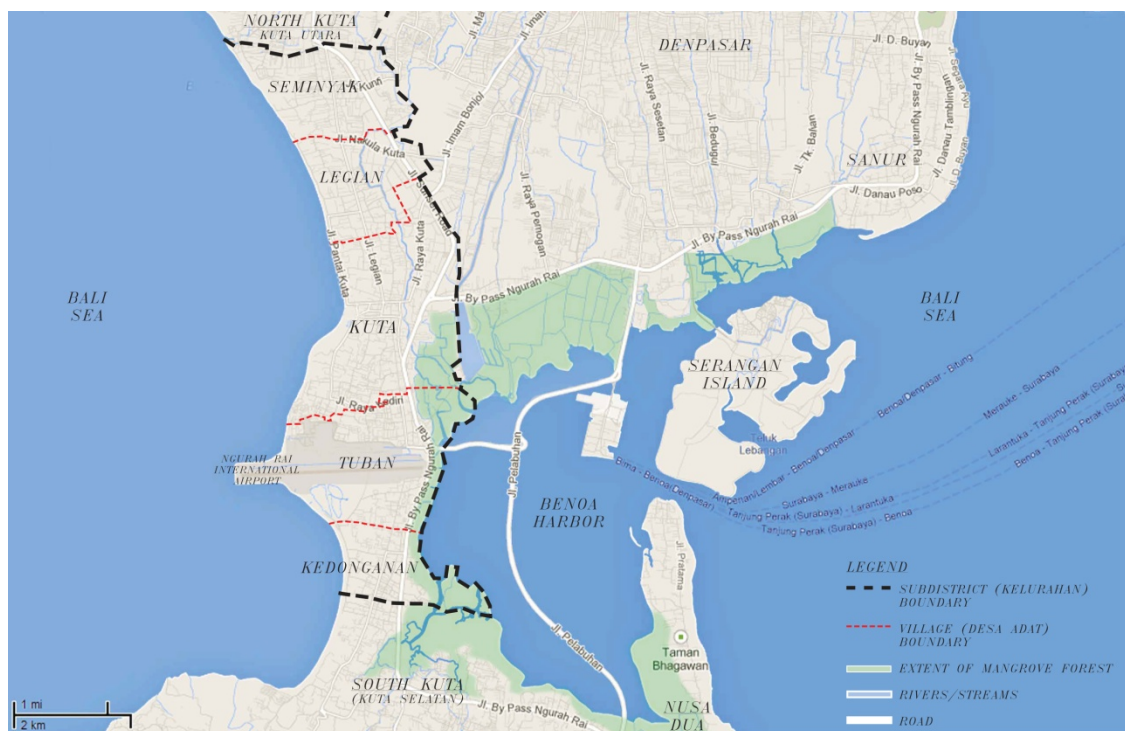


Figure 16. Kuta's administrative boundaries and extent of Prapat Benoa mangrove forest.

Source: Google Earth



### **The Tukad Mati River and Prapat Benoa Mangrove Forest**

Kuta's major river, the Tukad Mati River, starts about 10 kilometers north in Bali's central lowlands fed by various watershed and spring sources and serving numerous villages and agricultural fields along the way. Thus, by the time the Tukad Mati reaches Kuta, the river's water highly is polluted with surface runoff, agricultural runoff with fertilizer and pesticide contamination, septic, solid, animal, industrial, and various other wastes due to lack of waste management and enforcement coupled with traditional cultural and religious perceptions of the island's waterways as waste absorbers. The river runs parallel about one kilometer east from Kuta's famous coastline before emptying into the Prapat Benoa mangrove forest on the eastern coast of the Bukit Peninsula.

Unknown to most visitors and even locals, Bali boasts a large and extensive mangrove forest, the Prapat Benoa mangrove which is managed by the Ngurah Rai Grand Forest Park. Covering nearly 1,375 hectares within Benoa Bay on the south-eastern coast of the island the mangrove stretches from *Denpasar* in the north to Nusa Dua on the Bukit Peninsula. Mangrove forests consist of a diverse group of trees, palms, shrubs, vines, and ferns that thrive in waterlogged saline soils subjected to regular flooding from inland freshwater sources and ocean tidal changes. Most commonly found within tropical and subtropical sheltered coastal areas, mangroves can also be found along freshwater banks. Due to the unique nature of mangroves, they serve numerous beneficial ecological, societal, and economic functions. From an ecological perspective, Mckee (Feller and Sitnik 1996, 5-6) lists four major roles of mangrove forests:

1. Mangroves contribute to soil formation and help stabilize coastlines.
2. Mangroves act as filters for upland runoff.
3. Mangrove systems serve as habitat for many marine organisms such as fish, crabs, oysters, and other invertebrates and wildlife such as birds and reptiles.
4. Mangroves produce large amounts of detritus that may contribute to productivity in offshore waters.

Mckee (Feller and Sitnik 1996, 6) further attributes the following characteristics that are

especially important for humans:

1. Mangrove forests serve as protection for coastal communities against storms such as hurricanes. It has been suggested that the large loss of life (300,000 to 500,000 lives) in Bangladesh during the 1970 typhoon was partly due to the fact that many of the mangrove swamps protecting those populated coastal regions had been removed and replaced by rice paddies.
2. Mangrove forests serve as nurseries and refuge for many marine organisms that are of commercial or sport value. Areas where widespread destruction of mangrove has occurred usually experience a decline in fisheries.
3. Many threatened or endangered species reside in mangrove forests.
4. Mangrove forests are also important in terms of aesthetics and tourism. Many people visit these areas for sports fishing, boating, bird watching, snorkeling, and other recreational pursuits.

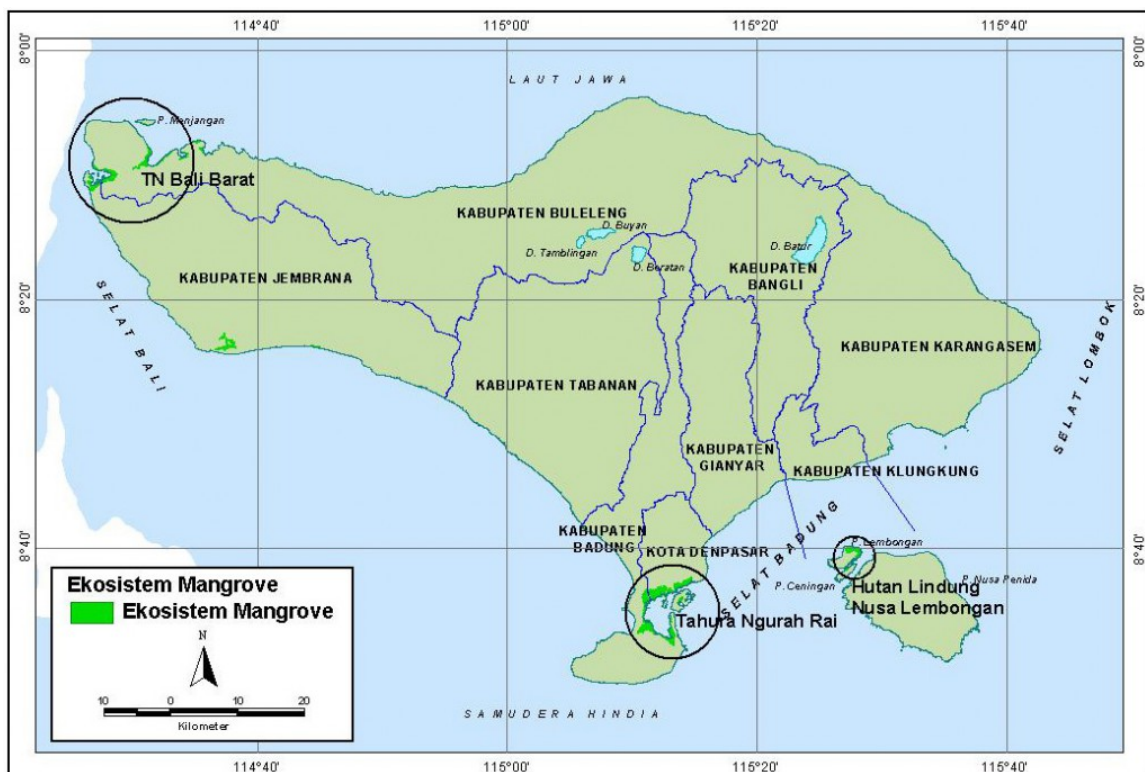


Figure 18. Location and extent of Bali's mangrove forests.  
Source: mangrovecareforum.com

Despite increasing global awareness regarding the value and importance of mangroves, poor land-use management and enforcement due to economic and political reasons have profoundly degraded the brittle ecosystem. With escalating pressures from industries dependant on the quality and health of marine ecologies, Bali's mangroves have gained new interest and attention in order to protect and restore the island's unique ecosystem. Forum Peduli Mangrove Bali, a non-profit based in Bali, has studied and catalogued the condition of the island's numerous mangroves. According to their studies in 2012 ([mangrovecareforum.com](http://mangrovecareforum.com)) of all Bali's mangroves 11.44% are heavily damaged, 9.1% damaged, and 79.47% not damaged, with the most damage occurring within the Prapat Benoa forest. Within the past decade, by means of government support and foreign investment, the Mangrove Information Center of Denpasar was establish and has constructed a visitors' center, elevated wooden trails, elevated *bales*, and floating decks for various recreational and educational activities, including guided tours and animal watching ([www.bali-travelnews.com](http://www.bali-travelnews.com)) throughout 200 hectares of mangrove forest a few kilometers east of Kuta. Although these facilities exist, poor marketing and budgetary problems have stagnated the development of eco-tourism for Bali's mangroves.

It is a shame that two large natural ecosystems within Kuta's vicinity have been neglected and damaged by ongoing urban growth. As Kuta strives to remain a top international holiday destination, a large push to improve urban conditions and living qualities for its residents and visitors is necessary. I believe with the introduction of strategic civic, landscape, and infrastructural interventions that engage and enhance the use of the Tukad Mati River and Prapat Benoa mangrove forest may spark a shift in cultural, economic, and public value of these natural ecosystems. By reclaiming the Tukad Mati river and Prapat Benoa mangrove forest into the urban and cultural fabric, somewhat turning the attention away from the beach, will allow for a sustainable model of economic and urban growth.

## **VII. WATER AS AN AXIS OF URBAN DESIGN**

The booming urban development of Kuta has changed the presence of the Tukad Mati River as a village edge to being embedded within the urban fabric. Kuta's current urban planning and design does not engage the river as a potential axis of development. Public access to the river is greatly limited due to the privatization of agricultural lands which extend to the river's edge and lack setbacks. Most property along the river is privately owned except at roads which are state property, where public contact is typically limited to. As the current urban environment turns its back to the river, there is a lack of awareness or knowledge of the river and its poor physical condition. However, as Kuta the growth of Kuta continues, the Tukad Mati River has the potential to become a vibrant civic site; a spine of water-based, culturally sensitive urban development integrated with landscape infrastructure that re-invents the traditional use of the *subak*, which brings people closer to each other and to the island's natural resource.

### **Methods of Intervention**

Based on the sectional analysis, in what ways can the river be engaged and re-integrated into Kuta's urban context? Addressing the following factors is key to a successful development of the Tukad Mati River: ecology, hydrology, culture, access, urban context. How can the river be accessed and engaged by the public? What are its potential civic uses and activities? How can the river's development respect, promote, and influence Bali's unique culture? How can the river become a cultural hub? How can awareness of the *subak* and river's water quality be raised? How can the surrounding natural ecosystems be preserved, restored, and augmented? How is the surrounding land use and urban context addressed? In order to address these questions and understand the river within its natural and urban context, a sectional analysis of the river is needed.

### **An Urban "MRI"**

In order to understand the existing context of the Tukad Mati River and Prapat Benoa mangrove forest as well as their surrounding environments, numerous section studies were cataloged along the river stretching north to south from the Kuta's northern administrative boundary to its discharge point into the mangrove forest. The underlying

issue supported by the "MRI" study is the total lack of civic engagement and acknowledgement between the urban context, river and mangrove forest. Overall, land use along the river's edge is predominantly commercial and industrial, although residential and hospitality developments are beginning to spread from the coast inland despite government land use regulation. The properties adjacent to the river lack setbacks due to lax building regulation and enforcement, thus many properties build to their property lines with high walls on top of pre-existing stone retaining walls. The river, lacking its natural edge, has been transformed into a wall-lined water course; merely a utilitarian water channel. Adding to the degradation of the natural river edge, the lack of waste management and water treatment, due to political and economic hardships, has prompted many developments to discharge their waste into the river. However, the waste problem is also rooted within Balinese culture. As I mentioned before, this "turning-the-back" to the river is rooted in the Hindu perception of rivers as cleansers of physical and metaphysical impurities. In the past, domestic and village trash was made of natural materials, which were able to biodegrade and be washed away within the *subak* irrigation ditches, not harming the natural environment. However, with the introduction of plastics and same waste management practices, trash piles grew. The Balinese now burn their trash piles, releasing harmful chemicals into the air and water systems when washed away by rains, or even abandon their trash at the river's to be washed out to sea.

The consequences of such development has resulted in the heavy degradation of Kuta's natural ecologies that were dependent on the river's water quality and surrounding ecosystems. With close proximity to the coast and mangrove forest, and its flat topography, Kuta prior to its tourism boom used to be a pristine natural environment with great plant and animal biodiversity and a fertile agricultural zone. Today, any existing green space (former agricultural plots) within Kuta is typically left unused, held by its owner to sell off to speculative developers. The sectional study has revealed a number of green spaces along the river that can be developed into recreational and civic nodes; attractions to which locals and tourists can visit when they seek a change of scenery from the coast.



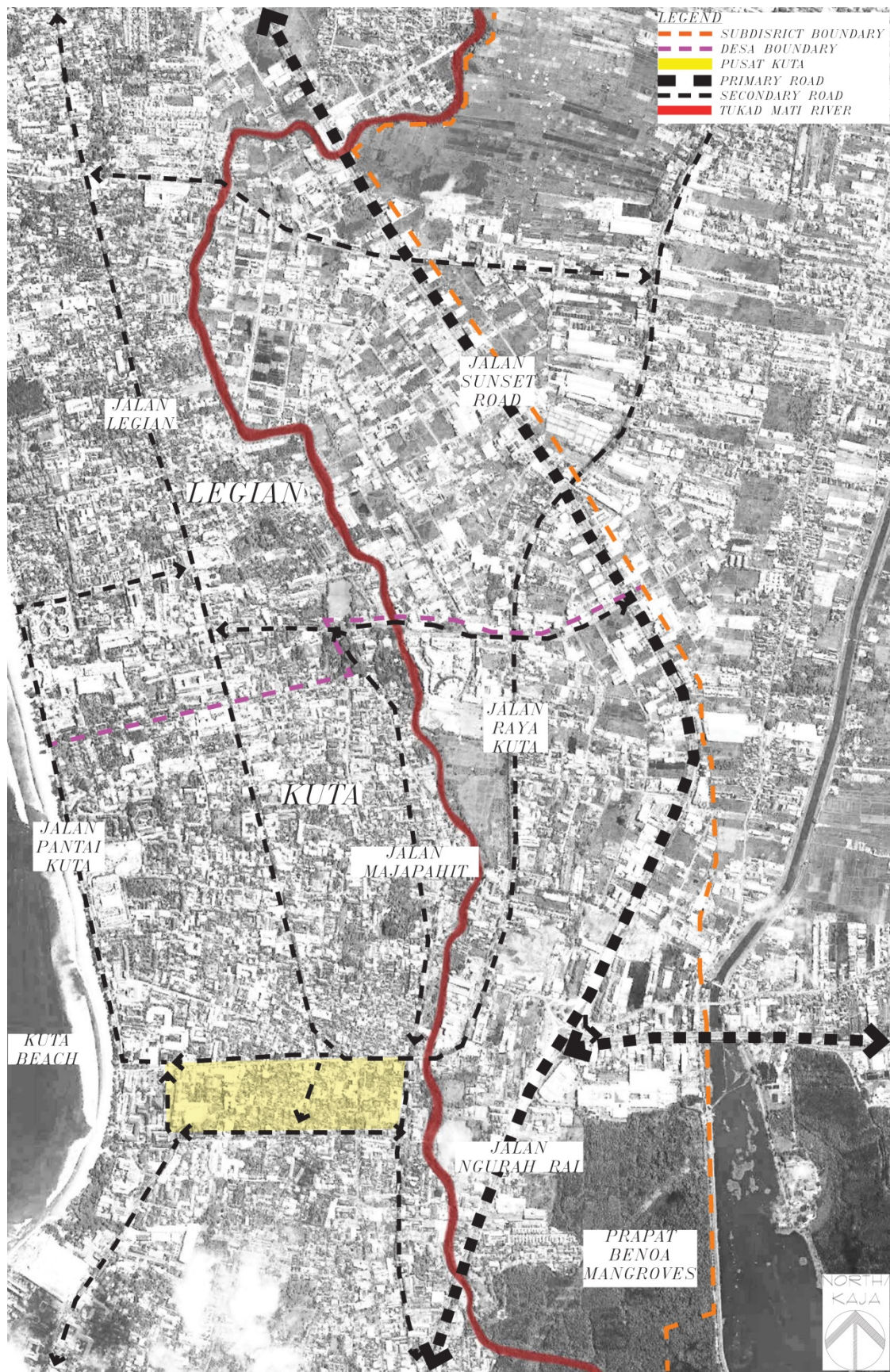


Figure 19 (pg. 28)  
Overall plan of Kuta



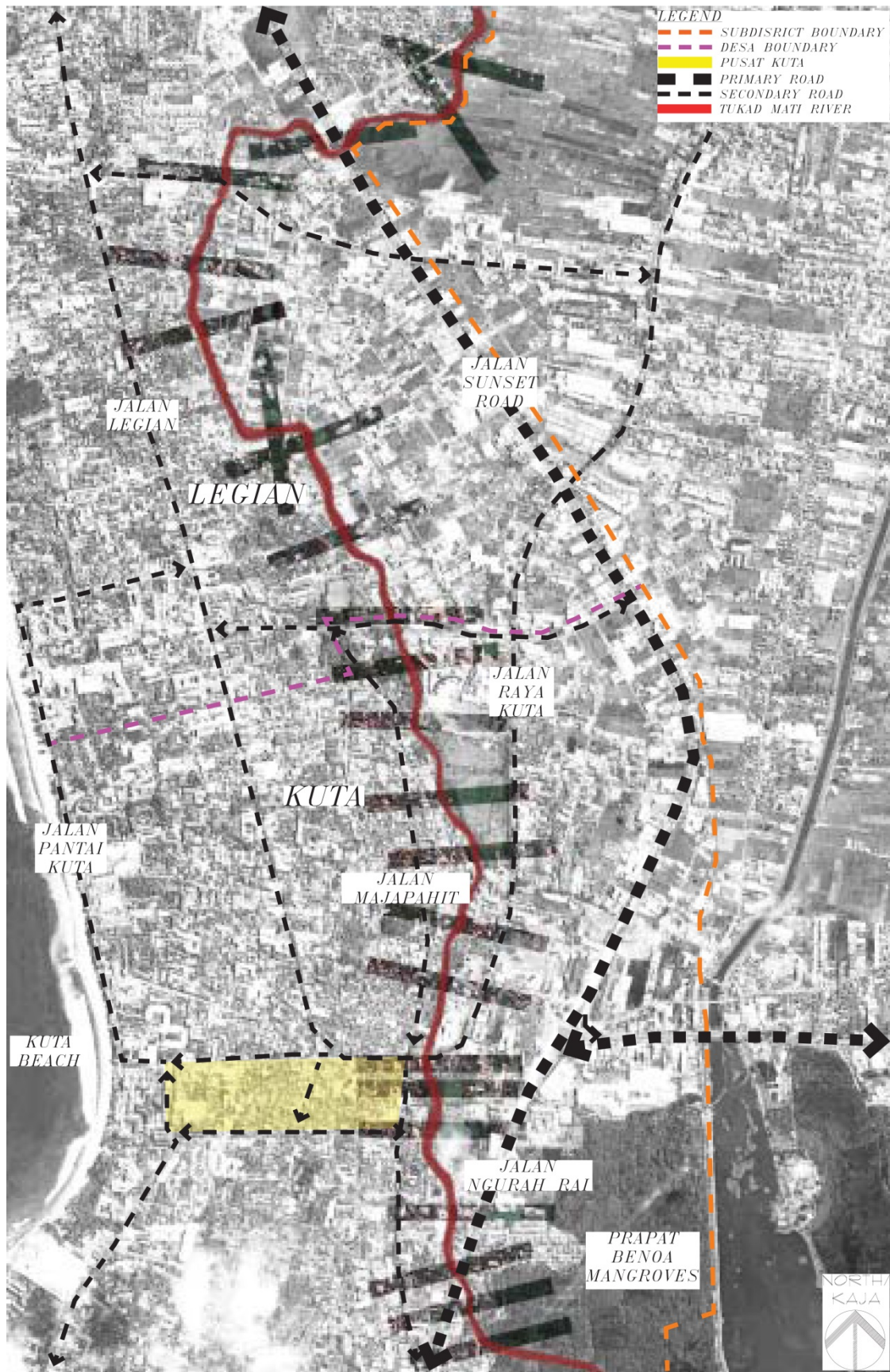


Figure 20. Locations of section studies.

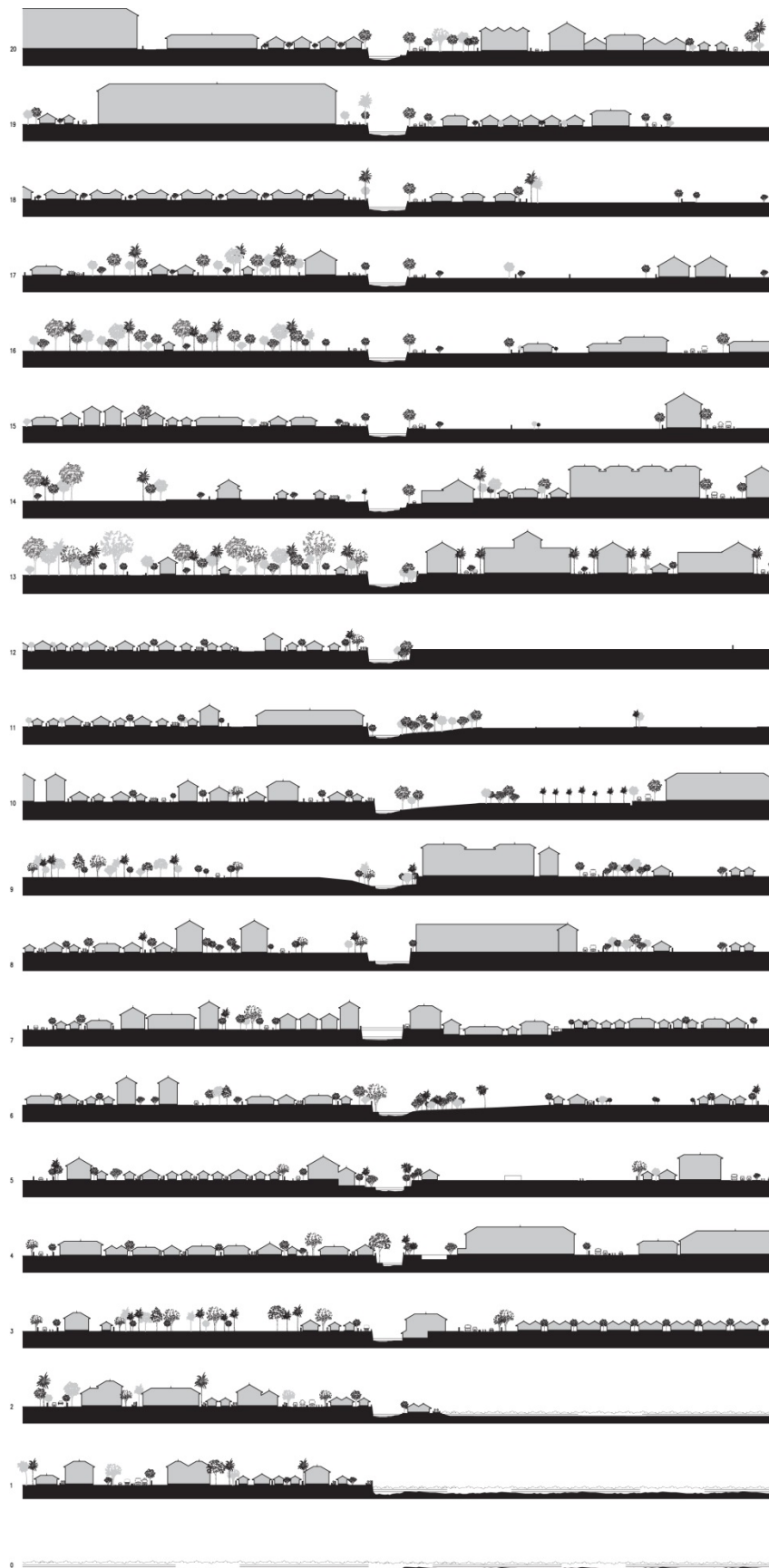


Figure. 21 Sectional analysis of the Tukad Mati River.

This conceptual "MRI" of the urban and natural conditions not only reveals problems and shortcomings of past and current development, but highlights sites or pockets for urban "interventions" meshing civic, infrastructural, and ecological functions.

### **Intervention Sites**

From the overall sectional analysis, I've chosen "sites" within *desa* Kuta along the Tukad Mati River based on the following: proximity to Kuta's traditional village square, areas of vacant or undeveloped green space, pedestrian and vehicular adjacencies and access, variation in scale, condition of river edge, and areas adjacent to multiple land uses. Each site has particular characteristics that differ from the others, thus each site has the potential to serve as a unique node of attraction along the river spine development. Following are site descriptions and analysis which shall serve as a foundation for the intervention proposals.

#### Site 1 (pg. 64)

- Located approximately 1.2 kilometers northeast of *Pusat Kuta*.
- A large area of undeveloped and previously agriculture land along the eastern edge of the Tukad Mati River.
- *Jalan Raya Kuta* (3 lanes – dual direction) and open *subak* canal runs directly parallel to the eastern edge of the green space.
- *Jalan Majapahit* (2 lane – dual direction) runs parallel to the west of the river, however separated from the river by a thin strip of commercial and residential developments. Residences dominate land use west of this road.
- Adjacent to predominately commercial and industrial developments to the north, east, and west. Hospitality developments at its south boundary.
- Large shopping complex, the Kuta Central Mall, and associated public parking directly to the north of the site.



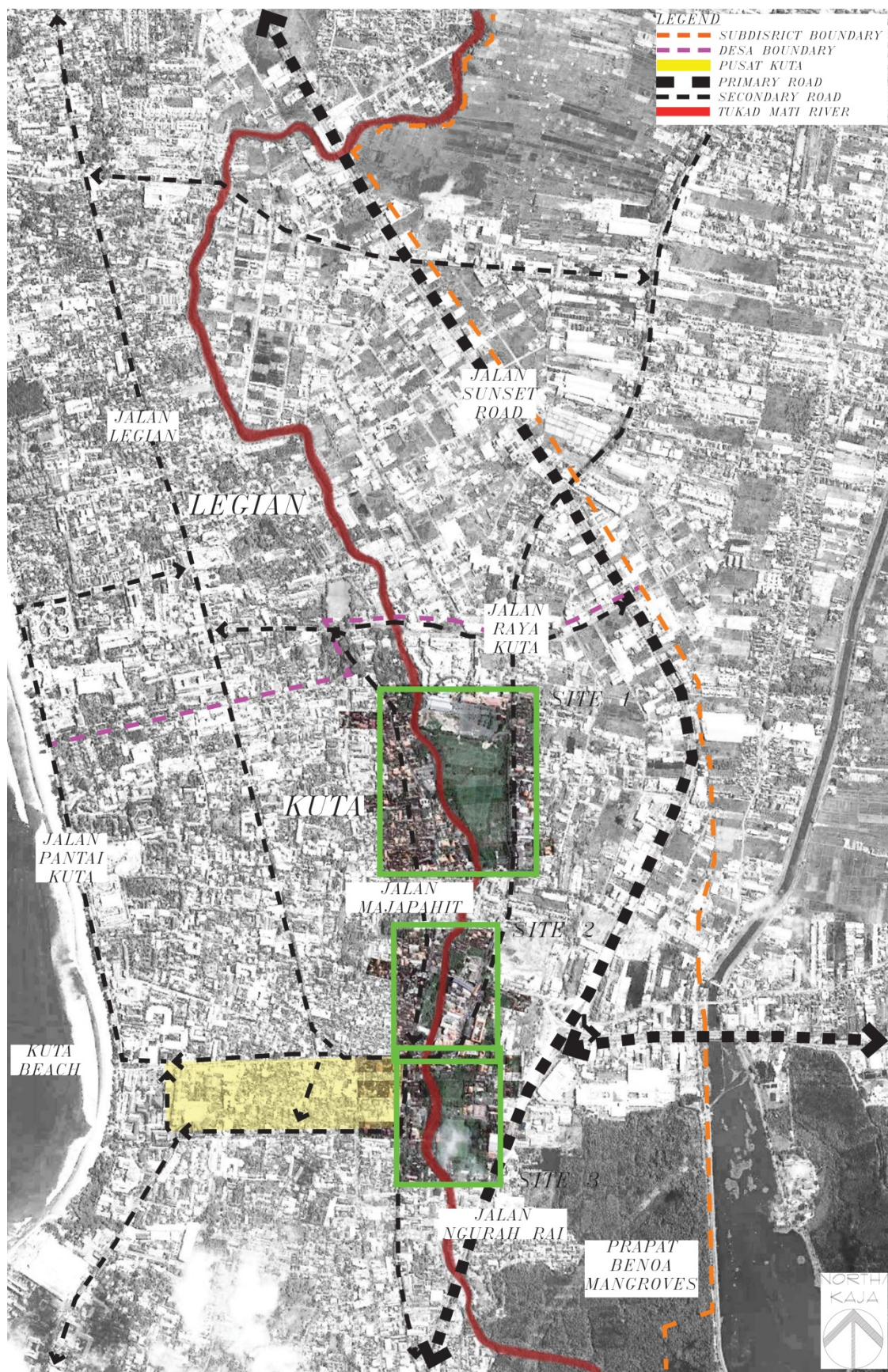


Figure 22. Location of intervention sites





**LEGEND**

- COMMERCIAL/INDUSTRIAL
- VILLAGE RESIDENCES
- CULTURAL/INSTITUTIONAL
- HOSPITALITY
- GREEN SPACE

- PRIMARY ROAD
- SECONDARY ROAD
- RIVER FLOW
- SURFACE RUNOFF DRAINAGE

**SITE 1 ANALYSIS**



Site 2 (pg. 66)

- Located approximately 400 meters east of *Pusat Kuta*.
- Pockets of undeveloped green spaces on each side of its banks.
- *Jalan Majapahit* (2 lane – dual direction) runs parallel to the west of the river, however separated from the river by a thin strip of commercial developments and undeveloped green space. Residences and large hospitality developments dominate land use west of this road.
- To the river's east, hospitality and commercial developments separate the river from *Jalan Raya Kuta*.
- At the southern boundary of the site is bridge that allows *Jalan Raya Kuta*'s traffic to cross the river.

Site 3 (pg. 67)

- Located approximately 400 meters east of *Pusat Kuta* and 200 meters south of Site 2.
- Pocket of undeveloped green space adjacent to Kuta's traditional village *alun-alun* (also used as a soccer field) on its eastern bank.
- *Jalan Majapahit* (2 lane – dual direction) runs perpendicular, passing over a bridge at the north of the site with adjacent commercial developments.
- Residences and cultural/institutional facilities dominate land use west of the river.
- To the river's east, hospitality and commercial developments are progressing westerly from *Jalan Ngurah Rai*.
- At the southern boundary of the site is a bridge that allows pedestrian/small vehicle access across the river to reach the *alun-alun*/soccer field.





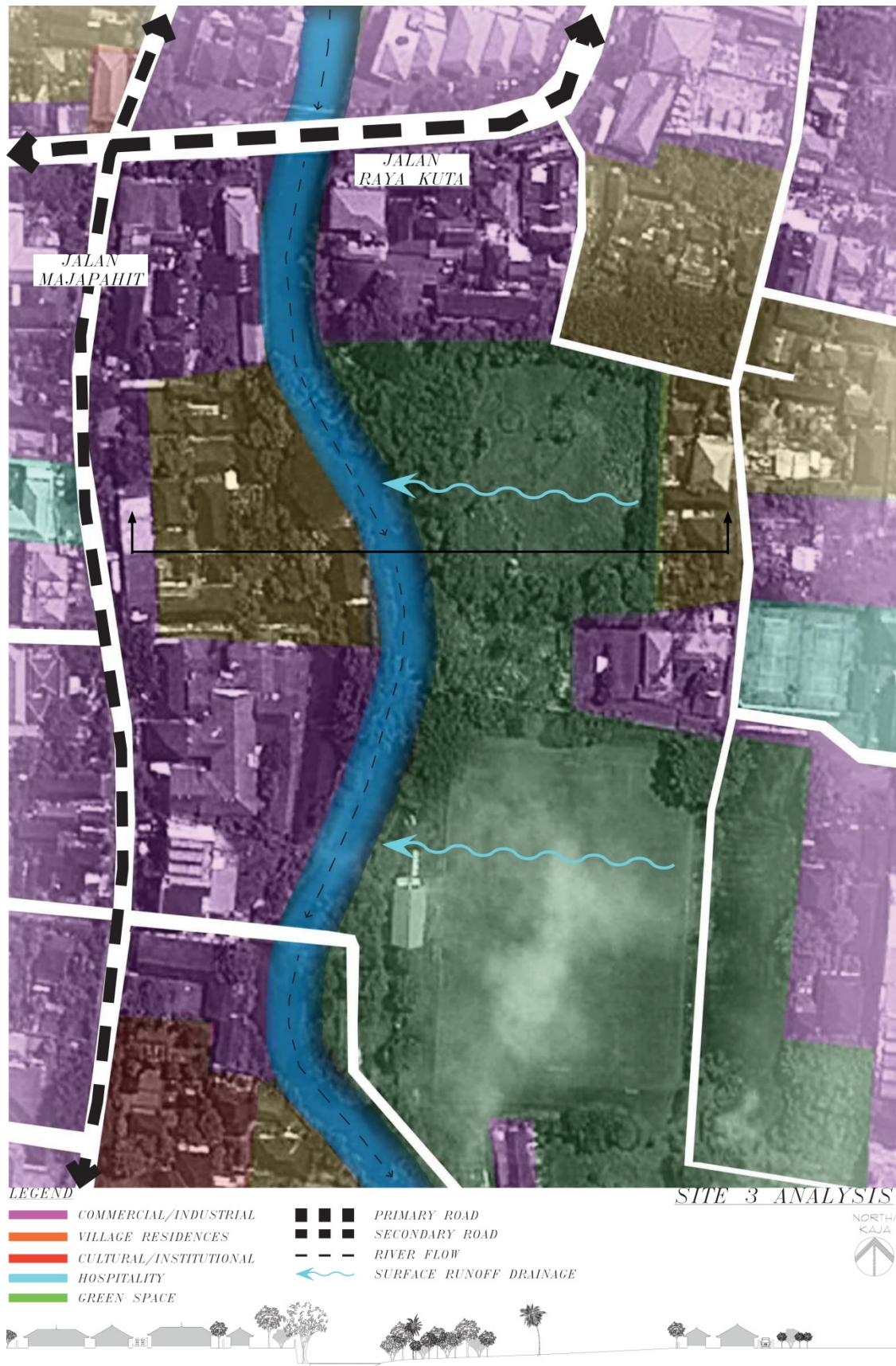
LEGEND

- COMMERCIAL/INDUSTRIAL
- VILLAGE RESIDENCES
- CULTURAL/INSTITUTIONAL
- HOSPITALITY
- GREEN SPACE

- PRIMARY ROAD
- SECONDARY ROAD
- RIVER FLOW
- SURFACE RUNOFF DRAINAGE

SITE 2 ANALYSIS







These initial sites have the greatest potential to serve as catalysts for water and river-based urban revitalization along the Tukad Mati River as well as other urban rivers on the island of Bali. With their close proximity to Kuta's village core and tourist developments, the sites are located in a critical area of future real estate speculation and development, thus it is imperative that the sites are utilized for civic spaces to serve not only the local population but also visiting tourists looking for other activities aside from the coastal attractions.

### **Intervention Proposals**

The following conceptual proposals pose possible solutions for development for the three sites. They are externally linked by the river and aim to provide opportunities for economic, social, cultural, and ecological growth for Kuta. The proposals are conceptual transformations of the traditional water temple and *subak* network. Each civic node along the river represents a center of ecological and hydrological importance, integrating civic spaces and hydrological and landscape infrastructure. Although the proposals utilize contemporary design, engineering, and technology, they embody Balinese cosmological and geomantic philosophy which promotes a sense of place for an urbanizing and modernizing Balinese city.

### **Overall River Improvements**

- Any new residential, commercial, industrial, and hospitality related developments along the edge of the river must include a three meter setback from the river's edge to allow for the construction and addition of landscape, landscape infrastructure (i.e. bioswales, *subak*, etc.), and pedestrian/bike paths, which shall extend the entire length of the river.
- Commercial and hospitality developments, existing and new, are encouraged to allow for public access from road to river by means of courtyards, landscaped alleys, or lobbies, thus enhancing the connections between the urban and natural environments, as well as promoting social interaction between locals and tourists.
- Vehicular and pedestrian bridges across the river shall be retrofitted to include stairs and ramps in order to access river paths.

- The river's edge, starting from its source, should be re-naturalized, bioengineered, and landscaped with indigenous plants that have bio-filtering properties in order to minimize the amount of contamination and pollution reaching the mangrove forest and ocean.
- With further hydrology study and collaboration with *subak* associations, weirs and reservoirs can be utilized to help slow flow of water.

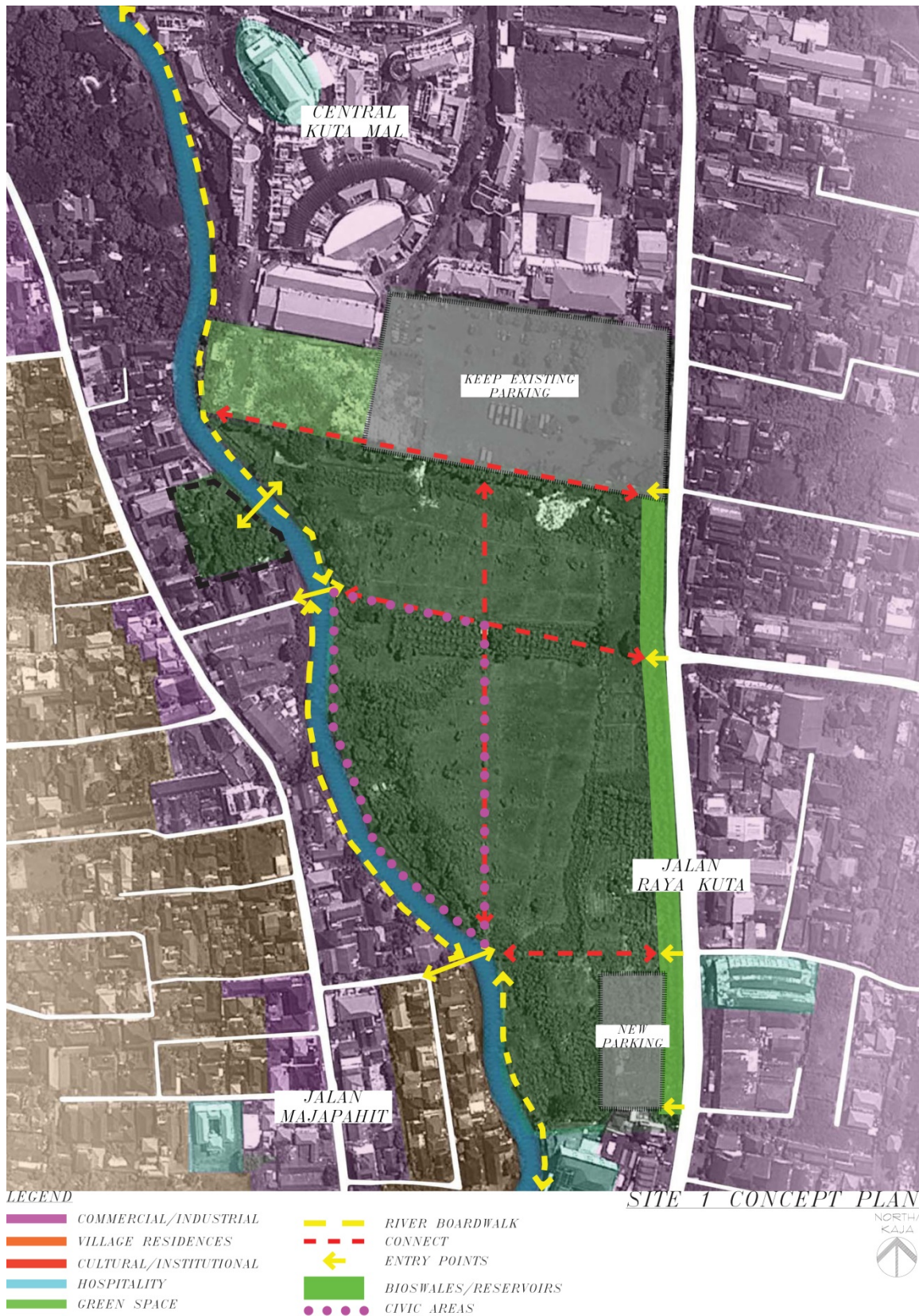
#### Site 1 (pp. 71-73)

Site 1 focuses on the utilization and transformation of the large unused green space into an urban park due to its close adjacencies to residential and commercial zones, especially the Central Kuta Mal. The park will consist of a number of landscaped and architectural courtyards that provide various spaces for events, socializing, relaxation, and exercise.

- A series of bio-swales shall be constructed along *Jalan* Raya Kuta to collect and filter storm water runoff. During heavy downpours, water will be piped to bio-retention ponds near the center of the park for further filtration and groundwater recharge.
- Northeast (*kaja-kangin*) area to be engineering into a cleansing biotope as a undulating terrace, a re-invention of the *sawah*.
- Where pedestrian paths or architectural elements do not occur, the river's edge shall be re-naturalized, incorporating bio-engineering features as utilized.
- Park entrances shall be located at street intersections, incorporating traditional Balinese split-stone gateways.
- Commercial zones along the river are encouraged to allow public access to the river. The idea is to allow pedestrian passage through the park and river as means of urban access.
- Existing and adjacent parking lot to be landscaped, and covered with permeable paving. Small parking lot at the south of the park to accommodate park users.
- River terraces to be constructed along river edge to be used for public events, performances, and general use as a civic space.
- Bridges across river to integrate *subak* wier infrastructure to slow flow of water within cleansing biotope. Water-based cleansing biotopes will serve as reservoirs

during dry season.

- The river edge directly adjacent to residential zones shall not have public paths and park space opposite the river shall be landscaped to buffer noise and wind-borne pollution.

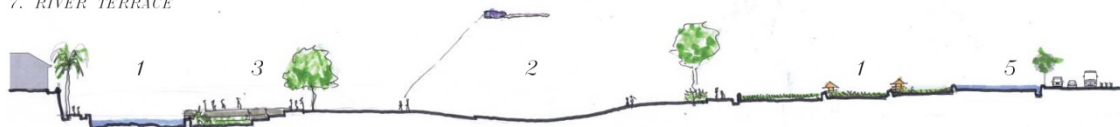






- LEGEND
- 1. CLEANSING BIOTOPE
  - 2. LAWN
  - 3. SUBAK WEIR
  - 4. PARKING
  - 5. BIOSWALE
  - 6. PUBLIC SQUARE
  - 7. RIVER TERRACE

SITE 1 INTERVENTION

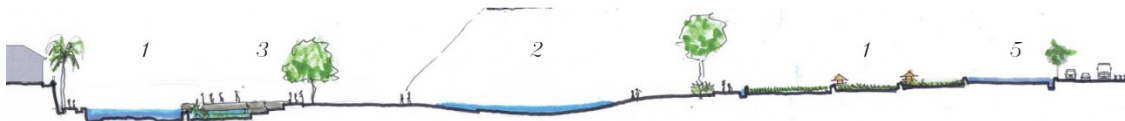






- LEGEND
- 1. CLEANSING BIOTOPE
  - 2. LAWN
  - 3. SUBAK WEIR
  - 4. PARKING
  - 5. BIOSWALE
  - 6. PUBLIC SQUARE
  - 7. RIVER TERRACE

SITE 1 INTERVENTION  
FLOODED



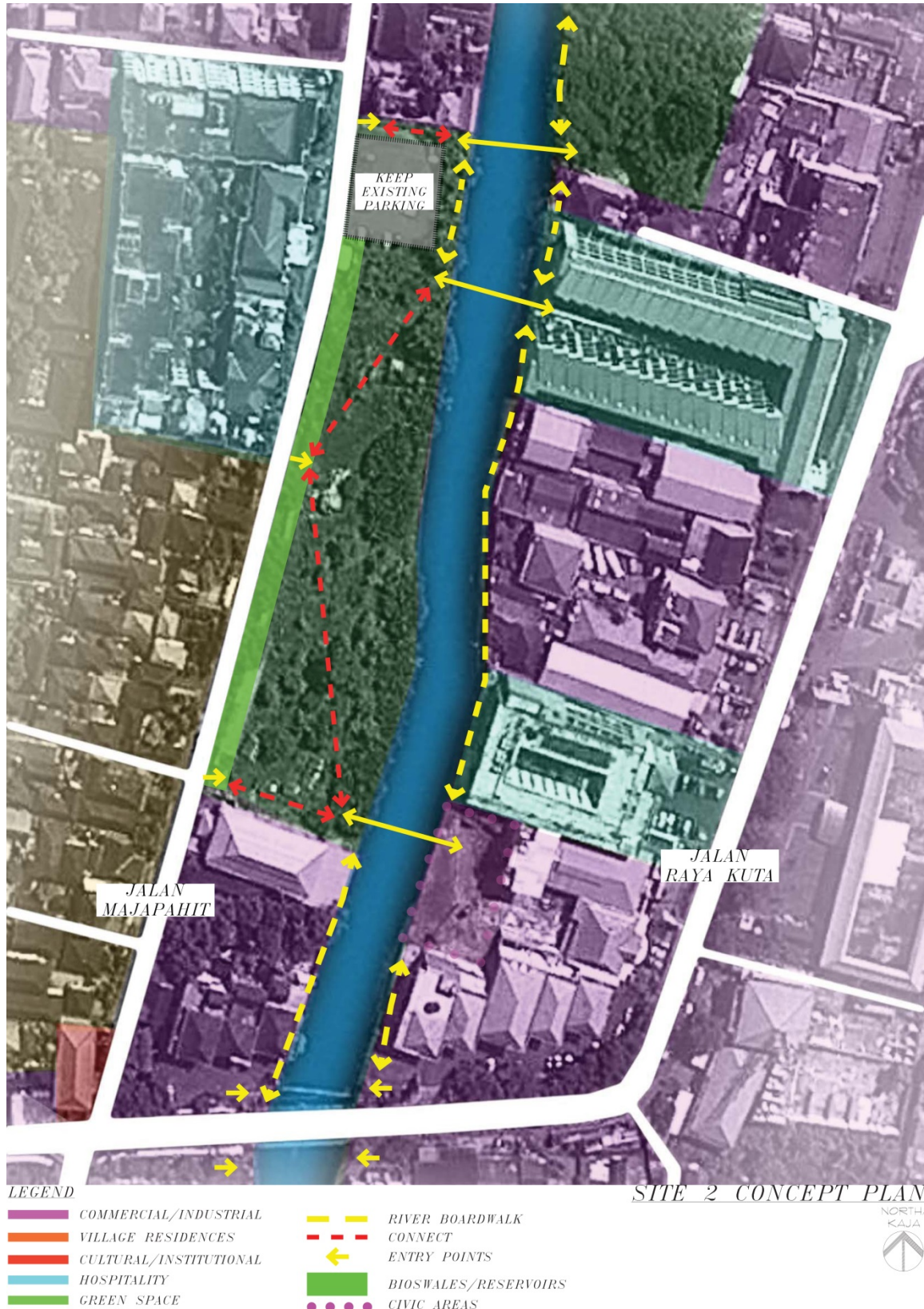
## Site 2 (pp.75-76)

Site 2's proposal focuses on connecting small unused green spaces and a small under-utilized and open commercial space by means of landscape and *subak* infrastructure.

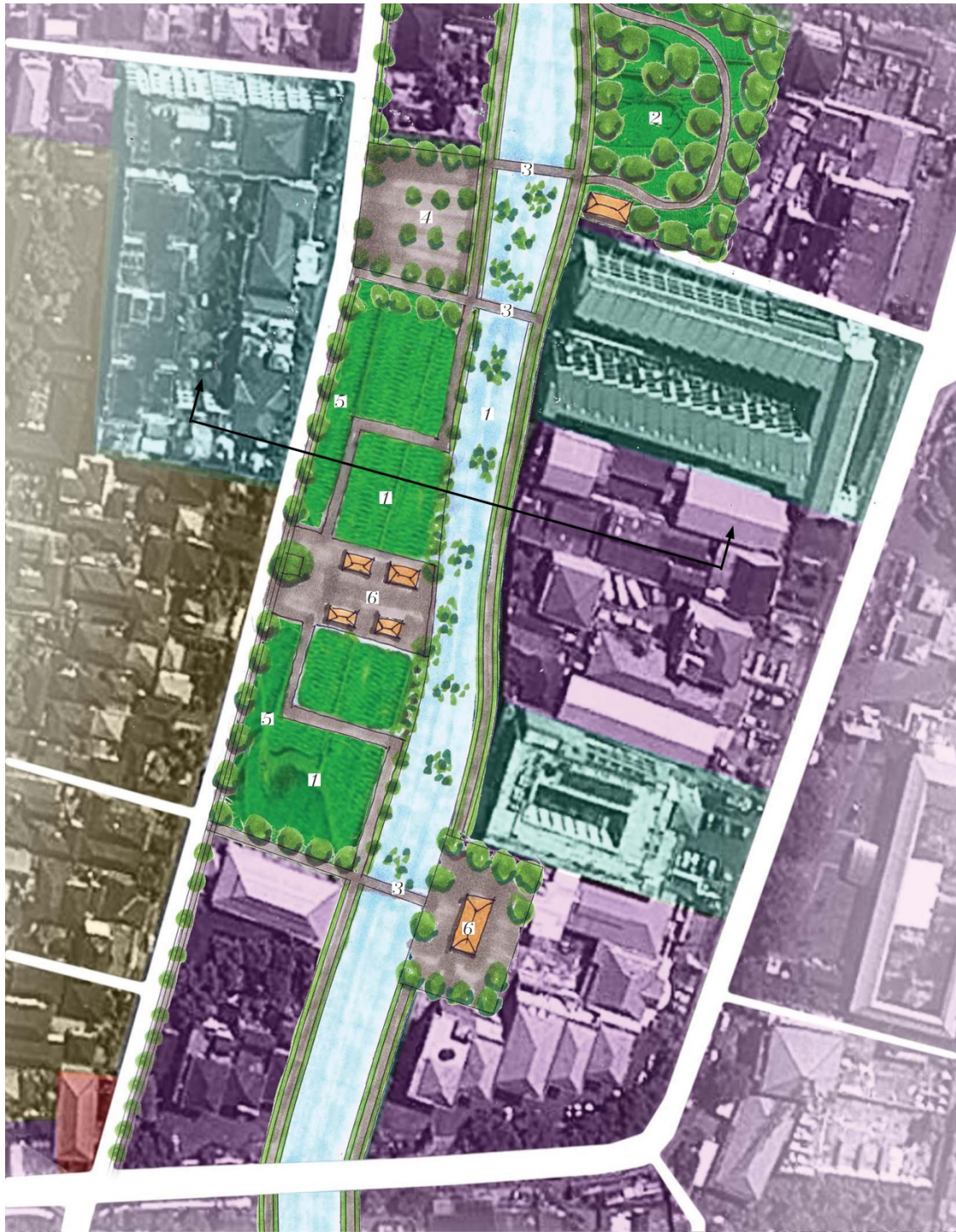
Each green space will be transformed into cleansing biotopes that with open civic space for community use.

- A bio-swale shall be constructed along *Jalan Majapahit* to collect and filter storm water runoff. Water will be directed to the terraced cleansing biotope along the western edge of the river.
- Existing parking area at the north of the western green strip shall be retained, landscaped, and paved with permeable paving to allow water recharge, bio-filtration, or potential storage.
- Where pedestrian paths or architectural elements do not occur, the river's edge shall be re-naturalized incorporating bio-engineering features.
- Commercial zones along the river are encouraged to allow public access to the river. The idea is to allow pedestrian passage through the park and river as means of urban access.
- River terraces to be constructed along river edge to be used for public events, performances, and general use as a civic space.
- Bridges across river connecting commercial and parks nodes to integrate *subak* wiew infrastructure to slow flow of water within cleansing biotope. Water-based cleansing biotopes will serve as reservoirs during dry season.









- LEGEND
- 1. CLEANSING BIOTOPE
  - 2. PARK SPACE
  - 3. SUBAK WEIR
  - 4. PARKING
  - 5. BIOSWALE
  - 6. PUBLIC SQUARE

SITE 2 INTERVENTION  
FLOODED

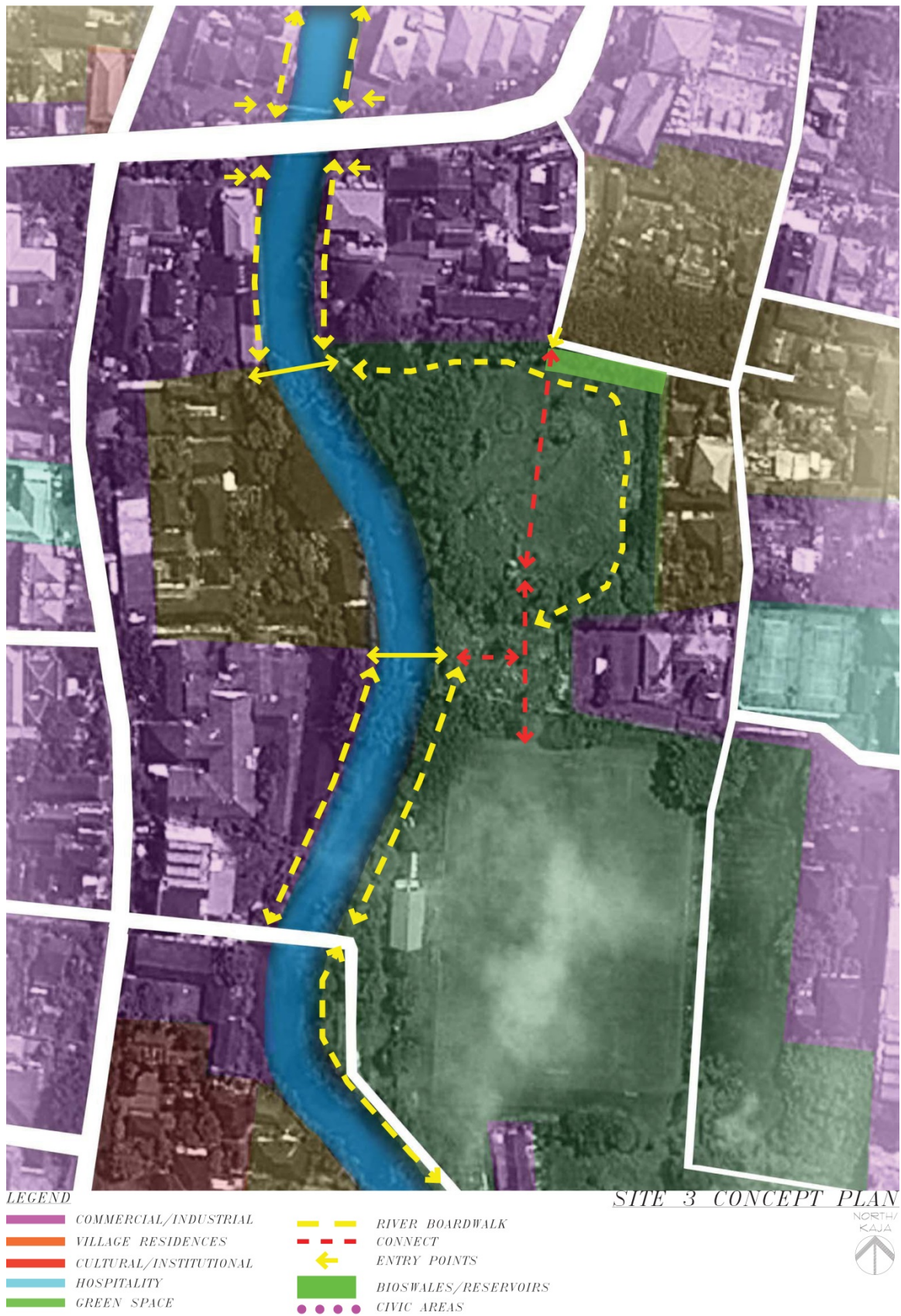


Site 3 (pp.78-80)

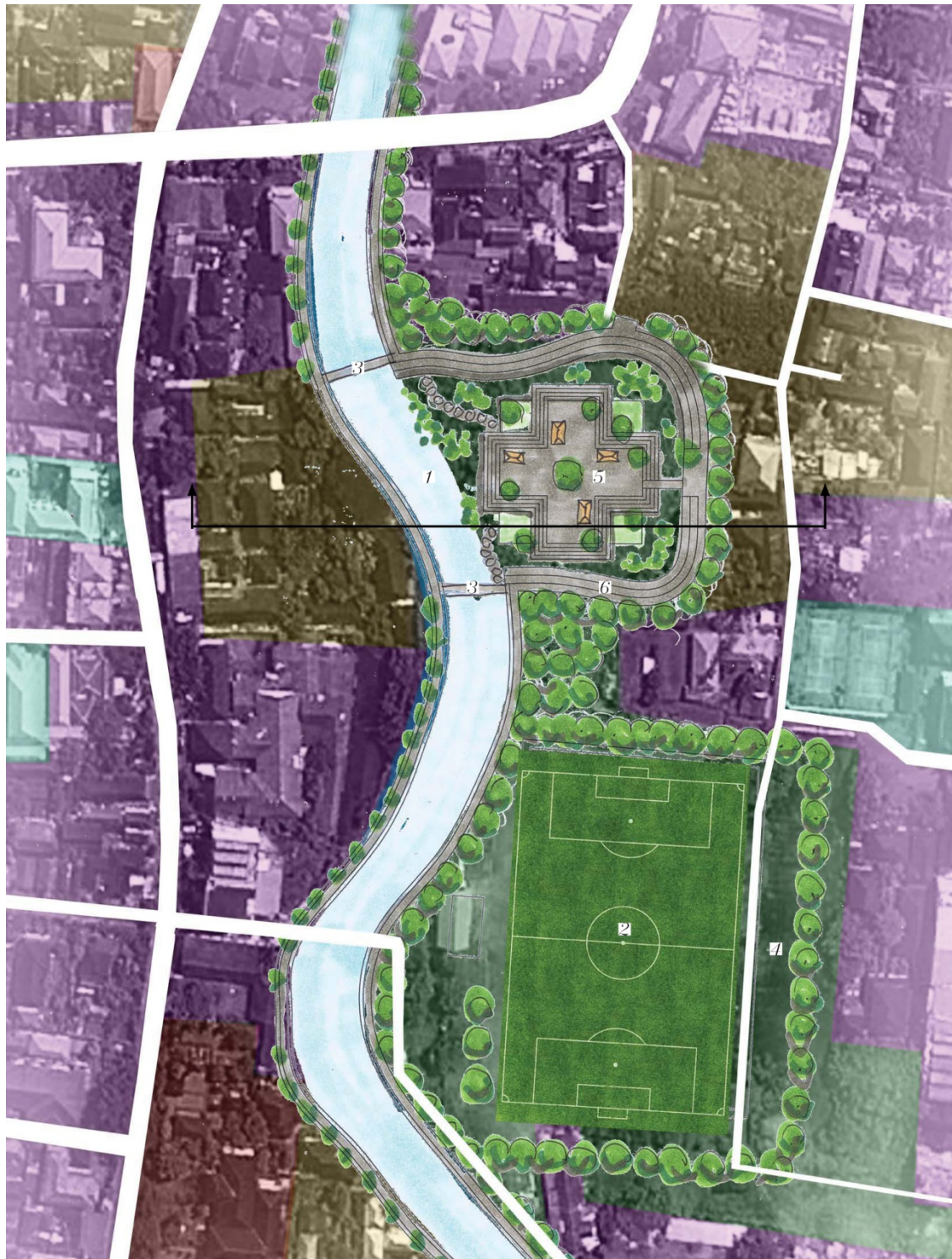
Site 3's proposal focuses on connecting a small unused green space with Kuta's traditional *alun-alun* field, which has been appropriated into a soccer field by means of landscape and *subak* infrastructure. Like the previous two sites, each green space will be transformed into cleansing biotopes that with open civic space for community use.

- A small bio-swale shall be constructed along the small vehicular lane in the north east of the green space to collect and filter storm water runoff. Water will be directed to cleansing biotope along the western edge of the river.
- Within the green space, the terraced river boardwalk shall be brought away from the river, around a terraced plaza with a mandala plan that shall be constructed with *bale* for exercise and recreational use.
- Where pedestrian paths or architectural elements do not occur, the river's edge shall be re-naturalized incorporating bio-engineering features.
- Commercial zones along the river are encouraged to allow public access to the river. The idea is to allow pedestrian passage through the park and river as means of urban access.
- River terraces to be constructed along river edge to be used for public events, performances, and general use as a civic space.
- Bridges across river connecting commercial and parks nodes to integrate *subak* wiew infrastructure to slow flow of water within cleansing biotope. Water-based cleansing biotopes will serve as reservoirs during dry season.
- The river edge directly adjacent to residential zones shall not have public paths and park space opposite the river shall be landscaped to buffer noise and wind-borne pollution.







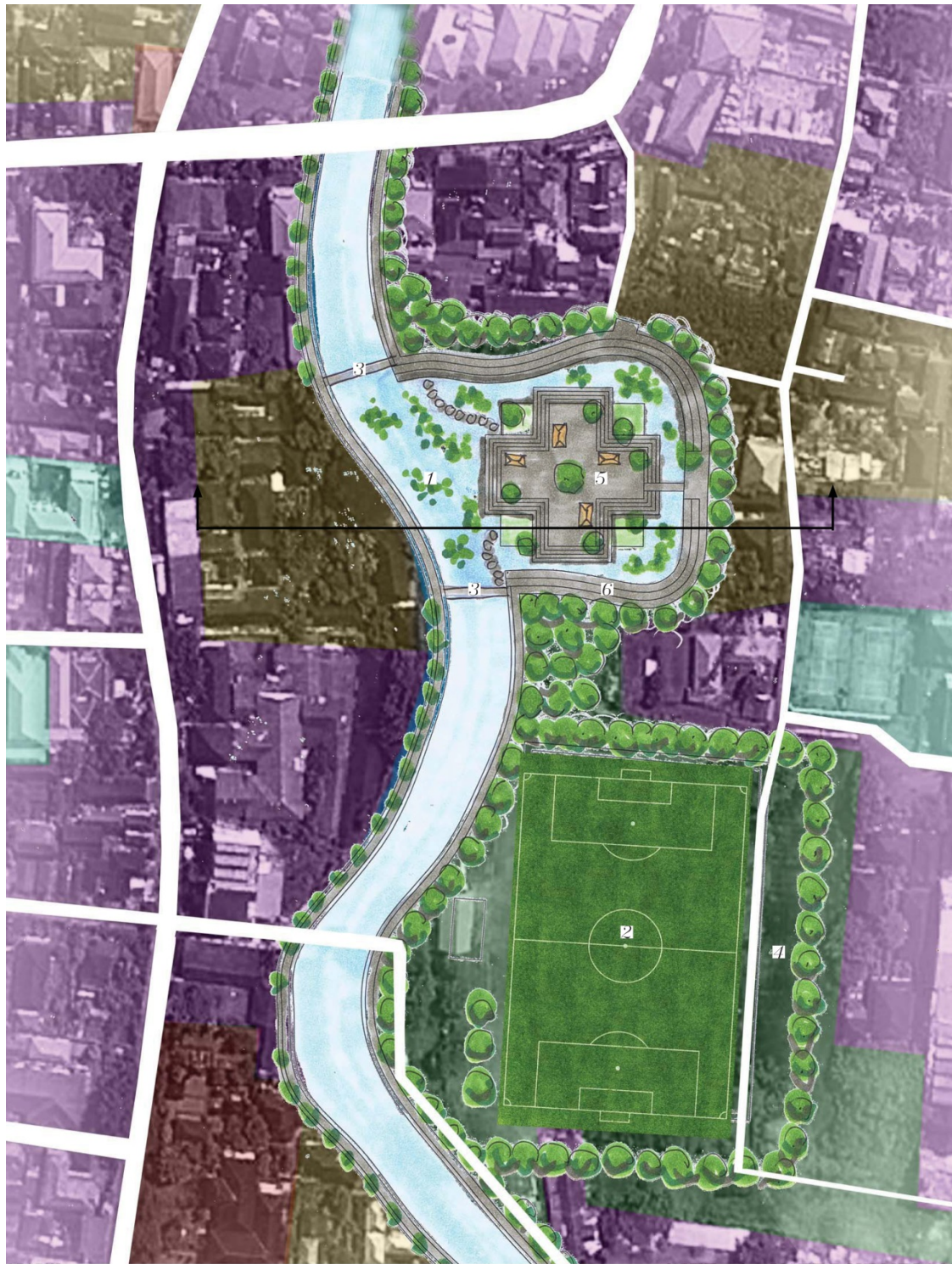


- LEGEND
- 1. CLEANSING BIOTOPE
  - 2. ALUN-ALUN
  - 3. SUBAK WEIR
  - 4. BIOSWALE
  - 5. EXERCISE PAVILIONS
  - 6. RIVER TERRACE

SITE 3 INTERVENTION







- LEGEND
- 1. CLEANSING BIOTOPE
  - 2. ALUN-ALUN
  - 3. SUBAK WEIR
  - 4. BIOSWALE
  - 5. EXERCISE PAVILIONS
  - 6. RIVER TERRACE

SITE 3 INTERVENTION  
FLOODED



## Conclusion

As Bali continues to urbanize, boosted by increasing numbers of foreign visitors and a growing population, a critical assessment of what Bali could and will be in the future as an international destination is highly necessary by its stakeholders, including the government, local population, and hospitality industry. Fears of cultural loss, constant degradation of the island's natural ecologies, and the hope for economic sustainability demand a fresh and innovative perspective for future urban developments that marry traditional and contemporary functions.

Fundamental to the theme of this project is the role of water in Balinese culture. The hierarchal network of water temples that link numerous *subak* associations have efficiently produced two harvests of rice for over a thousand years, engineering a cultural landscape of sculpted terraces that stretch from the mountains to the sea. The site intervention proposals, although conceptual, provide potential solutions to revitalizing the Tukad Mati River, bringing awareness to a neglected ecosystem, and reintegrating the river back into the urban fabric.

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